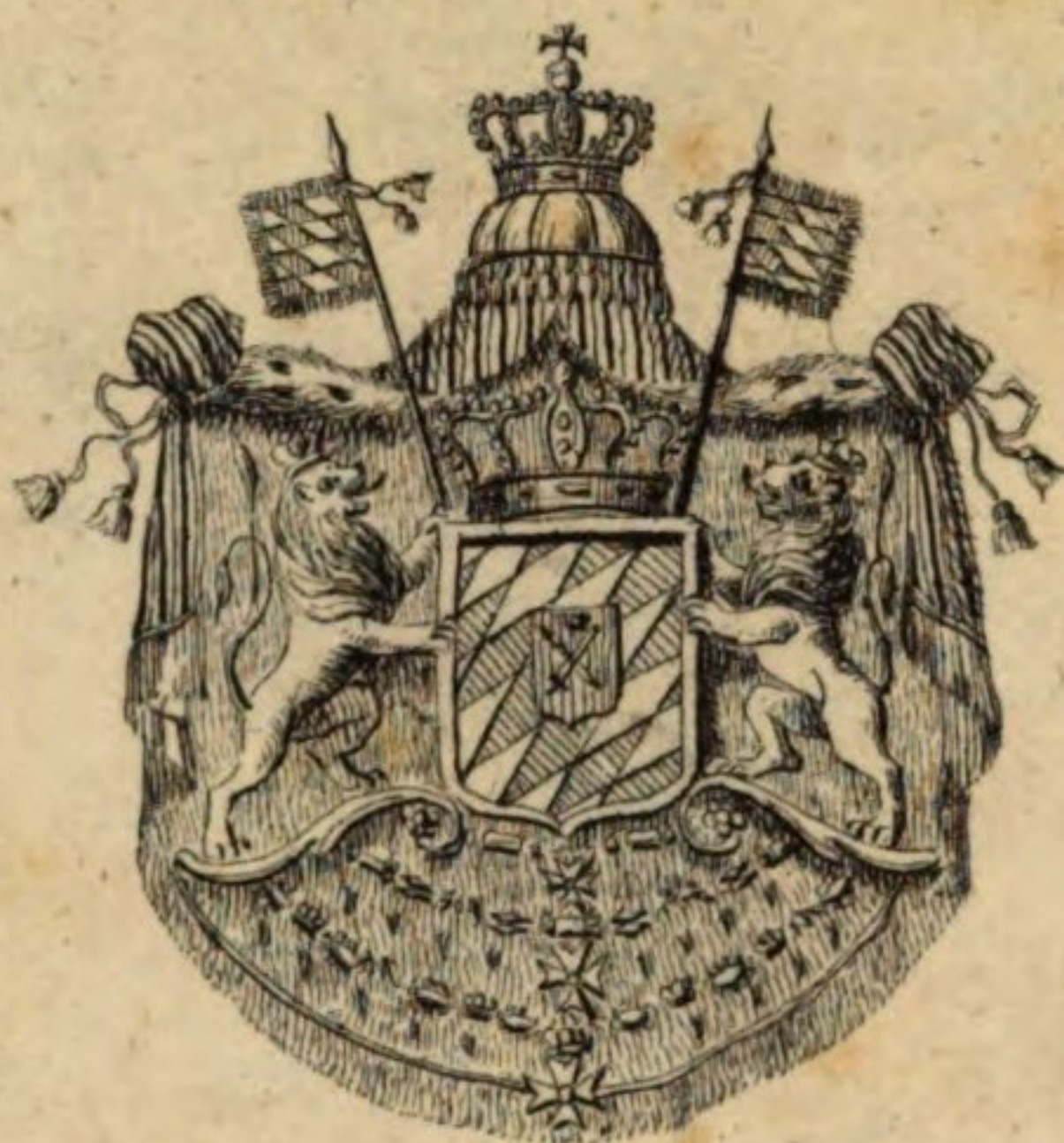


520^a

1842



**BIBLIOTHECA
REGIA
MONACENSIS.**

*Amicissimo et nobilissimo Prasidi
de Schreber
mittit auctor.*

~~1842~~

Phyt. 778

Hist. nat.

520?

Phyt. N^o 191.

A
SYNOPSIS
OF
THE BRITISH FUCI.

BY
DAWSON TURNER, A. M.

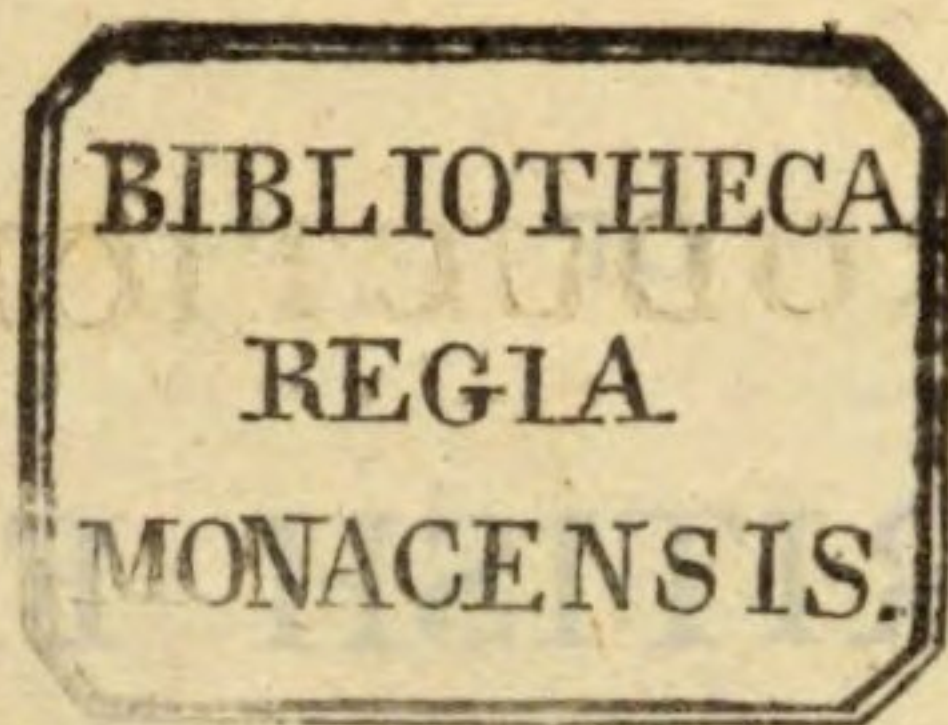
MEMBER OF THE IMPERIAL ACADEMY NATURÆ
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VOL. 1.

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.....
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INTRODUCTION.

Before I enter upon the task of describing the several species of Fuci, it cannot be amiss to offer some slight remarks upon the peculiarities connected with the physiology of these curious vegetables. In doing this, I shall confine myself as far as possible to recording facts which have fallen under my own observation; and shall carefully abstain from indulging in speculative opinions, under the full conviction that we are at present too little acquainted with them to fix any thing which may stand the test of future investigation, or be likely to meet the concurrence of succeeding botanists. I must be allowed also to say a few words upon the subject of the present undertaking, which was at first intended to have been little more than a republication of Dr. Goode-

nough and Mr. Woodward's excellent paper in the third volume of the Linnæan Society; but which it afterwards appeared best to write entirely anew, following indeed, in great measure, the plan laid down by those gentlemen, and in many instances availing myself of their knowledge; yet no where, I trust, at least no where designedly, without acknowledging my obligations to them on the subject. The difficulties that attend the attempt to elucidate any branch whatever of natural history are so well known, that to enlarge upon them would be idle and superfluous: but it must be evident that among the Fuci these difficulties prevail to a far greater extent than can be the case in the vegetables which we cultivate in our gardens, or may see daily in the fields; and if the writers who have treated even upon the most common phænogamous plants have differed in their opinions, and been under the necessity of soliciting the indulgence of their readers for those errors,

—— quos aut incuria fudit,

Aut humana parum cavit natura,

such an apology can hardly fail of being infinitely more necessary from one who attempts to describe the species of a tribe, where, to the obstacles that attend upon all the orders of the class Cryptogamia,

are added many more of a peculiar nature, arising from the element they inhabit, the difficulty of approaching them, and other circumstances. Longer delay, and less interrupted leisure, might undoubtedly have produced a more perfect work; but were perfection an idea which on this subject ever once entered my mind, I have no hesitation in declaring that this book would certainly not have appeared for many years, most probably not at all. My aim is far more humble. Since the publication of the *Flora Anglica*, *Flora Scotica*, and *Botanical Arrangements*, nay even since that of the *Observations on the British Fuci*, some new species have been ascertained, and many not unimportant discoveries made: these, partly contained in Mr. Stackhouse's *Nereis Britannica*, partly scattered through other works, and partly never yet printed, it is my object here to collect into one body, and, by comprizing them in a small compass, to record what is already known; and to present, I trust, no unacceptable companion to those botanists who, in their residence near the sea, wish for some assistance in the investigation of its productions. Another motive for the undertaking was, that no complete work, exclusively appropriated to the *British Fuci*, has been at present published. The only attempt of the

kind was made by my friend Mr. Stackhouse, and even he has declined figuring or describing those species of which plates had been given by any preceding English author. On this account, also, I flatter myself I shall escape the imputation of having obtruded upon the public an altogether useless or unnecessary production. I have written it in my native tongue, because, from its nature, it has little chance of ever extending beyond the boundaries of this island; and because many of those, into whose hands it is likely to fall, may possibly on that account find it somewhat more convenient: had its subject been more general, I should undoubtedly have preferred composing it in Latin; and if, as I sincerely hope, my opportunities and leisure should allow me at some future period to undertake the bolder task of publishing an history of all the Fuci hitherto known, there will be no longer reason to complain of the language in which the present volumes now make their appearance. With regard to those points in which I have differed in opinion from the gentlemen who have preceded me, I must call upon the candour of my readers not to impute these differences to either vanity or a love of singularity. Where I have seen mistakes, I have of course either noticed, or at least avoided them; to

have done otherwise, would not have been discharging my duty either to myself or the public; but I trust I have in all cases expressed myself with that diffidence which an earnest zeal for the promotion of science cannot fail to inspire; and wherever I am myself mistaken, I shall feel certainly under obligations to any botanist who will take the trouble of convincing me of my errors. With regard to figures, I have given none; not only on account of the additional expence necessarily attendant upon engravings, but also because English Botany will in time comprize plates of every species; and, still more, because I was unwilling to do any thing which might make this work appear of more consequence than I really considered it myself. In point of references, I feel that I have been, from my situation in the country, under the necessity of omitting some, which a residence in the metropolis, and access to Sir Joseph Banks' splendid library, would have enabled me to introduce. This is particularly the case respecting the Fuci of the Flora Norvegica, many of which an opportunity of consulting Bishop Gunner's figures in the *Acta Nidrosensia* might possibly have enabled me to clear up; and I have regretted it the more, as the author of that work was unquestionably an excellent observer;

and in the first volume, where he trusted chiefly to his own remarks, has thrown considerable light upon them. In the second, which was not published till some time after, he seems to have aimed only at collecting a quantity of species, and hence has greatly copied what other authors had written, more than once introducing the same plant under different appellations.

The old Herbaria preserved in the British Museum are universally acknowledged to be of so much importance in the ascertaining several of Ray's, Morison's, and Hudson's species, that, though I have never seen, I should have been sorry to have omitted quoting, them. This, as the only part of my work for which I do not feel myself personally answerable, appears to require particular notice; and here, besides what I borrowed from Messrs. Goodenough and Woodward's paper, I am happy to acknowledge my obligations to my friend Mr. Dillwyn, who took the trouble of examining them with care on my account; and who, not only in this case, but also in many others, and especially in the synonyms of Ray's Synopsis, has been of the most material service to me in the course of the undertaking. I am proud also to own very great assistance from other of the most eminent marine botanists: but it is needless

to dwell upon these obligations in the present place, as it has been my aim and wish to mention every gentleman's name after the communications which he has been kind enough to afford me. An asterisk, subjoined to the specific name of a *Fucus*, denotes that the description was drawn up from a dried specimen, the mentioning which may possibly be the cause of preventing some confusion. In all other cases I was fortunate enough to have before me either plants entirely fresh, or such as had not previously been subjected to pressure; in which case most of the *Fuci*, though scarcely any of the *Conferva*, if again immersed in water, immediately recover their natural form. The synonymy is in many places imperfect; in some, I fear, erroneous. There is a peculiar difficulty attending it, from several authors, who have treated on the subject, never having seen the plants in their places of growth, or being even acquainted with those circumstances which tend particularly to characterize them in a recent state. Hence, in a few instances, it seemed better altogether to omit references, than, by introducing such as were imperfect or uncertain, to involve a doubtful subject in tenfold more obscurity; and hence also a mark of uncertainty will be found subjoined to several quotations. Linnæus himself, our great master,

did not perfectly understand the Fuci ; a circumstance by no means extraordinary, nor mentioned here with a view to detract in the least from his well-deserved reputation, but rather as a caution to those who, accustomed to look up to him with the veneration he is entitled to, consider him equally great in every department of botany. His Herbarium, relying upon which Dr. Goodenough and Mr. Woodward have rendered such eminent service to the students of marine algæ, by clearing up the synonymy of the Species Plantarum, is not without several important errors ; and, it is not to be denied, might, in less able hands, have proved the source of much confusion. What had been done before his time was comparatively very trifling ; for our great countryman, Ray, did not shine among this tribe of vegetables : and though of Morison's figures many are excellent, yet his work, from containing scarcely any descriptions, is not of that service it would otherwise have been. Gmelin, who published his *Historia Fucorum* at Petersburg in 1768, deserves to be considered the first author who ever wrote any thing of much importance upon the subject ; and it is to be lamented that the premature death of this great botanist in 1774, prevented the world from reaping any farther advantage from his labours. His

work, which, in the *Historia generalis*, contains not only every thing important noticed by preceding naturalists, but also an infinity of excellent observations made by himself; and, in the *Historia specialis*, is remarkable for the accuracy of its descriptions; will stand a lasting monument of his ability, and always entitle him to be considered the father of this branch of botany. We must indeed lament that, from his not having adopted specific characters, there is considerable trouble in investigating his plants; and that in some instances the references to the figures do not seem so accurate as might be wished. It is, however, the very excellence of the publication that makes it worth the while to point out defects of this nature. Subsequent to the time of Gmelin, the advances that have been made in the knowledge of the Fuci are very considerable; and for much the greatest part of these we are indebted to the botanists of Britain. The *Flora Anglica* sufficiently evinces Mr. Hudson's knowledge of the subject; and those descriptions in the *Flora Scotica*, which Mr. Lightfoot took the trouble of composing himself, prove that he was not only admirably acquainted with them, but eminently skilful in seizing upon their leading characters. How much then it is to be regretted that such a man should so unnecessarily

expose himself to the charge of plagiarism!—I would now wish to offer a few words upon the subject of Mr. Stackhouse's *Nereis*; of Dr. Goode-nough and Mr. Woodward's *Observations on the British Fuci*; and of the works of other botanists who have written upon the same subject. Their merits, however, are too well known for any additional encomia from me to add to their character; and I feel the impossibility of writing what I think, without giving rise to the suspicion that sentiments of private regard have biased what ought to be an impartial opinion. Dr. Esper, who is now publishing at Nuremberg "*Icones Fucorum*", of which four parts, containing one hundred and ten figures, have already appeared, is less known in England; and it may therefore not be amiss to observe that this indefatigable naturalist, spite of the important disadvantages arising from his situation, pursues his subject with unremitting zeal, and, from his extreme candour, and the excellence of many of his figures, promises to be of much service to this part of science. He is particularly assisted by Baron Wulfen, who, in the third volume of *Jacq. Coll.*, has given such admirable plates of several species, and who is unrivalled in the merit of decorating, by the elegance of his language, the sterile soil of bare descriptions.

Much also indeed is to be hoped from the labours of two botanical friends, Dr. Roth and Professor Mertens. I have, however, far exceeded the bounds I had proposed to myself on this subject, and I therefore turn at once to the physiology of the Fuci; in doing which I shall content myself with throwing out a few hints, reserving to some more favourable opportunity the closer investigation of the subject.

The genus *Fucus*, in its present state, at different points, borders upon, and touches, the surrounding genera of *Lichens*, *Ulvæ*, *Confervæ*, and *Byssi*, in such a manner, that, till a more appropriate distinction is found, experience only will enable us to know the individuals that compose it. The character assigned to it in the *Syst. Nat.* depends altogether upon the observations of Reaumur, and has already been so often refuted, that it cannot be necessary here again to repeat the arguments upon the subject, all which are to be found in Gmelin's *Historia Fucorum*, and indeed in almost every other subsequent work upon the subject. Hence * succeeding naturalists have been

* In Messrs. Goodenough and Woodward's paper, the generic character of *Fucus* is, "Semina,

at considerable pains to alter it; and † Mr. Stackhouse has gone still farther by sub-dividing the

tuberculis confertis apice dehiscentibus, innata.” In Dr. Roth’s “Bemerkungen uber das studium der cryptogamischen wassergewächse” it is “Vesiculæ aggregatæ in substantiâ frondis nidulantes, poris mucifluis præditæ.” Other authors have chosen other definitions.

† The synopsis of these genera in the second fasciculus of the Nereis Britannica is thus given:

FUCUS.—Fructificatio mucosa, pellucida: granulis suborbicularibus seminiferis intus: papillis conicis foratis extus—terminalis.

CERAMIUM.—Fructificatio mucosa pellucida, sine granulis seminiferis: papillis invisibilibus—per totam frondem.

CHONDRUS.—Pericarpium, ovatum immersum, utrinque prominens; seminulis intus in muco pellucido.

SPHÆROCOCCUS.—Granula seminifera suborbicularia; adnata, vel immersa; sessilia vel pedunculata.

CHORDA.—Fructificatio mucosa in cavitate frondis cylindricæ: seminulis glomeratis, nudis, cuti adhærentibus.

plants that compose it into six new genera: but, though I fully agree with that gentleman as to the necessity of such a measure, I cannot altogether acquiesce in the arrangement he has made, nor have I allowed myself at present to think of any other, because, when a thing of this nature is done, it is desirable that it should be done in a manner to preclude the necessity of future alteration, which can hardly be expected from a distribution framed solely upon the British species, without attending to those which are the natives of distant seas, and are so dissimilar in their appearances. On this subject I will offer the single hint, that the submersed algæ, with the addition perhaps of the Byssi and Tremellæ, ought to form a distinct order of the class Cryptogamia; and that, in a new arrangement, the first step must be to throw them into a general mass, paying no respect to the genera as they now exist, all of which comprize plants of the most anomalous nature, many Confervæ having the fruit of Fuci, some Fuci that of Ulvæ, and vice versâ. I might

CODIUM.—Fructificatio in tubulis implicatis—
frons cylindrico-compressa; statu madido,
spongiformis; sicco, tomentosa.

be tempted here to enter in some measure upon a slight digression respecting the remaining aquatic genera, were not the *Confervæ* already in the hands of Professor Mertens and Mr. Dillwyn, who will soon favor the world with their observations on the subject; and did I not wish to reserve what I have to say upon the *Ulvæ* till it is in my power to publish an history of them; materials for which I have been some time engaged in collecting.

How far the roots of *Fuci* are to be considered as subservient to nutrition, or merely designed by nature to fix them to their places of growth, is a subject on which nothing I have remarked at present enables me to contradict the generally received opinion; though I cannot but think it most likely that, as is the case in all other plants, those organs are in them also designed partly to answer both purposes. I shall not here enter upon a discussion of the point; but in support of such an idea I must be allowed to urge, that I believe the *Fuci* to be provided with a series of longitudinal vessels; and that I rest that belief upon the microscopical observation of thin, horizontal slices, cut from *F. saccharinus*, *lumbricalis*, and others, all which display an appearance similar to that of wood examined in the same manner. The midrib

of many other species must surely have been designed for the same purpose. These vessels, however, if the experiments of future naturalists should confirm their existence, must be wonderfully fine, for repeated attempts that I have made to discover them by means of quicksilver have constantly failed. Mr. Dillwyn, indeed, on placing the lower part of a dried specimen of *F. laceratus* perpendicularly in tincture of litmus, found the longitudinal veins absorb the fluid; but this, though it adds probability, is far from amounting to certainty, as a similar effect might have been produced by mere capillary attraction; yet in that case it would surely have risen to an equal height throughout the whole of the plant. With regard to the common objection that if a part only of a *Fucus*, which has been dried, is immersed, that part indeed recovers its former appearance, but the rest of the frond continues as dead as before; such an experiment has always appeared to me to prove little; for, to use no other argument, the same holds good in mosses, which, in their conformation, are not supposed to differ from what are called the more perfect vegetables. I, however, dismiss the subject; simply remarking that it leaves a wide field for future investigation. The horizontal vessels of *Fuci*, from which also

there is little doubt of their imbibing nutrition, are extremely apparent in many species, especially *ferratus* and *vesiculofus*: in the smaller ones also they may be observed on a bright sunny day, while the plants are growing on their native rocks; for the whole frond then seems covered with innumerable, short, woolly fibres; and that, not only on their sides, but also at the extremities, which circumstance probably gave rise to the conjecture in Dr. Roth's "*Bemerkungen*", * that they draw in their nourishment at their apices as well as their surface. Those in which I have remarked this appearance most forcibly are, *subfuscus*, *purpurascens*, *filum*, and *flagelliformis*. The same is sometimes observable in specimens of *ligulatus*, even after they are washed ashore; and perhaps it would not be carrying the analogy too far were we to refer to the same origin the pencils of hairs, that form the leading character of *pedunculatus*.

One of the most remarkable circumstances attending the physiology of the Fuci is the extreme rapidity of their growth and decay; a singular instance of which I had an opportunity of ob-

* P. 24.

serving when, in July 1798, I visited the rocks at Cromer, and found them almost exclusively covered with *Ulva filiformis*, Hudson, of which, in the following September, not a trace remained: but this, if we consider the gelatinous substance of the plant, is not perhaps wonderful. *Ulva plumosa* and *fistulosa*, together with *F. filum*, *dasyphyllus*, and *confervoides*, had then occupied its place, some whereof being at that time new to me, I returned about two months afterwards to procure a fresh supply, when, of them all, nothing but a few broken pieces of the last remained to prove their ever having existed; and they had been succeeded by *F. vesiculosus* and *Ulva umbilicalis*. Mr. Dillwyn, during his residence at Dover, observed several instances of the same nature; and the fresh-water *Confervæ* partake of this fugitive quality; for often, where I have known ditches filled with particular species, I have returned after a short interval, and found not even a vestige of them left. My friend, Mr. Stackhouse, in the second fasciculus of his *Nereis*, records a most interesting experiment connected with this subject, the nature of which is such, that I am sure no apology can be necessary for here inserting it at length. "Having procured a number of wide-mouthed jars, together with a

syphon to draw off the water, without shaking or disturbing it, on September 7, 1796, I placed my plants carefully in the jars, with their bases downwards, as in their natural state; on the following morning I decanted off the sea-water, and, letting it subside in the basin, I found a few particles at bottom, which, on being viewed in the microscope, appeared to be little fragments detached from the surface by friction in carriage. I then poured a fresh quantity of sea-water on the plants, and placed them in a window facing south; on the following morning the jar containing the plants of *F. canaliculatus* discharged into the basin a few yellowish grains, which, on examining them, I found to be the actual seeds of the plant; they were rather oval than pear-shaped: but the most curious circumstance that attended the observation was, that each individual seed was not in contact with the water, but enveloped in a bright mucilaginous substance. It was easy to guess the wise œconomy of nature in this disposition, which, as hinted above, serves a double purpose, each equally necessary towards continuing the species. On the following morning a greater quantity of seeds were discharged by this plant, and at this time a few seeds were procured from *F. ferratus*; but this latter plant discharged such a quantity of mucous

fluid, that the sea-water in which the plant was immersed was of the consistence of thin syrup, and, consequently, the seeds being kept suspended, it was difficult to separate them. The seeds of *F. canaliculatus*, however, were numerous, and visible to the naked eye; and, after letting the water rest for a few minutes, it was no difficult matter, by gently inclining the basin, to pour off the water, and let the seeds remain. In performing this operation I was witness to an explosion or bursting of one of these seeds or pericarps, which agitated the water considerably under the microscope, and brought to my recollection the circumstance mentioned by Major Velley, during his investigation of *F. vesiculosus*. I at last obtained a discharge likewise from *F. bifurcatus*; these perfectly resembled the others. Having established this point, viz. that marine plants scatter their seeds in their native element without violence, when ripe, and without awaiting the decay of the frond, I next procured some sea-pebbles, and small fragments of rock taken from the beach, and, after having drained off the greatest part of the water in the jar, I poured the remainder on the pebbles: I left them dry for some time that they might affix themselves: I then fastened strings to them, and alternately sunk them in sea-water in a

wide-mouthed stone jar, and left them exposed to the air, in order to imitate as nearly as possible their peculiar situation between high and low water-mark; and when the weather was rainy I took care to expose them to it. In less than a week a thin membrane was discoverable on the surface of the pebble, where the seeds had lodged, with the naked eye; this gradually extended itself, and turned to a darkish olive colour. It continued increasing in size, till at last there appeared mucous papillæ, or buds, coming up from the membrane: these buds, when viewed in the microscope, were rather hollow in the center, from whence a shoot pushed forth: in some instances they seemed to arise on a short, thick footstalk, and in this latter case resembled, in some measure, the *Peziza*-formed seedling of *F. loreus*, and the others, without stems, were like the stemless *Pezizæ*."

Another remarkable circumstance attending the *Fuci*, for which it is not easy to account on philosophical principles, is the great diversity of species produced by different places, even though but little removed from each other. Among phænogamous plants we know that *Malvæ*, *Urticæ*, *Lamia*, the more common grasses, &c. are predominant in almost every part of our island; but the same is far from being the case in the sub-

mersed Algæ; for of those which are abundant at Yarmouth, some have never been found at Scarborough, others never at Dover; and those shores in return produce a different tribe, whereof many have not at present been discovered in Norfolk. To carry this observation a little farther, I may add that the same holds good in the Isle of Wight, Weymouth, and Cornwall; and even those individuals that are common to several parts of our island appear in distant places under such various forms, that the collecting them is almost equally interesting as if they were distinct species. Some not only flourish most on, but seem peculiar to, chalk; some to sand-stone; some to hard, siliceous rocks: a remarkable instance whereof is afforded by Sherringham, a small village on the Norfolk coast, which though not more than four miles distant from Cromer, yet from its soil being quite different, produces different Fuci. This also seems to shew that the root of these plants is not without its use as an organ of nutrition. The size and texture of some species appear to be considerably influenced by the latitude in which they grow; thus plumosus is a stiff, cartilaginous plant in Scotland, but tender and flaccid as a *Conferva* at Dover: pinnatifidus, on the other hand, is small in Norfolk, but reaches a comparatively

gigantic stature in the Mediterranean : and numberless other instances of the same nature might easily be adduced. They are also affected by their situation near fresh water ; and, at the mouths of great rivers, often attain to an unusual size. The substance of the different species varies from coriaceous to membranous, and gelatinous ; their colours also are very different : both which circumstances I have mentioned under the several individuals, and have likewise, as far as I was able, noticed the changes produced in their hues from exposure to the sun, decay, or other circumstances. In general they preserve their tints uninjured by drying, except that the more brilliant ones lose some portion of their lustre, and the olivaceous ones turn black. The proper colour of these latter may, however, for the most part be detected by suspending them between the eye and a candle ; but this by no means holds good in all cases. I have endeavoured, where it was in my power, to notice the time in which each species fructifies, and what appeared to me most probably to be its duration. In the former of these particulars, the Fuci, as I have observed in * another

* Linnæan Transactions, v. p 126.

place, are as regular as the phænogamous plants; and it appears, from what has been hitherto remarked, that the more rough and coriaceous species prefer the stormy months of winter, while those of a delicate structure, together with the *Confervæ* and *Ulvæ*, produce their fruit chiefly in the beginning of autumn. The former, I believe, to be in general perennial, the latter annual. With regard to the various ways of fructification, or rather the various shape of the capsules observable in different individuals, I must decline entering upon the subject, as it would necessarily lead me into too long a digression, and I hope hereafter to say something about forming, upon this circumstance, a new division of the genus.

To what I have written in the descriptions of the species, I have only to add that, since the account of *F. dentatus* was printed, I have, through the kindness of Dr. Scott, of Dublin, been favoured with a beautiful drawing of a specimen from his collection, which proves that, besides the lineari-lanceolate capsules which I have described, it produces urceolate ones, also disposed in a racemose manner, and, when in maturity, opening at their extremities to give out their seeds: they are likewise remarkable under the microscope for small, spine-like processes issuing from them, and for a

fort of involucrium, formed at the rise of the partial footstalks. To the same gentleman I am indebted for much other valuable information, and for the sketches of some new species found by himself near Dublin, which I have great reason to lament arrived too late to be incorporated in the present work. This reason has also prevented my having the pleasure of adding to my list the *F. roseus* described by Mr. Stackhouse in his last fasciculus. The *F. thrix*, *costatus*, and *pallens* of the same author I have omitted, under the opinion that they belong more properly to the *Ulvæ*. The *F. byssoides* and *diffusus* of the Linnæan Transactions I have also omitted; the former being in every point of view a *Conferva*, and published as such in English Botany; the latter, though of more doubtful place, being described by all authors under the name of *Conferva elongata*, and most generally known by that appellation. The subdivisions of the species are precisely those adopted by Dr. Goodenough and Mr. Woodward, with the trifling alteration of "*fronde enervi*", instead of "*fronde aveniâ*", for the reason mentioned in the account of *F. laceratus*, and the omission of the division "*fronde hinc canaliculatâ*", as observed under *F. crispus*.

The use of the Fuci in the œconomy of nature

seems principally to afford food, shelter, and protection to the infinite tribes of fishes and marine insects. Some few of them have been made an article of food by mankind, and many others are applied to the support of cattle: besides which, the whole of them produce excellent manure; and, in the western counties of Britain, where they are thrown in immense masses on the shore, are eagerly collected for that purpose. In the Shetland Islands, the Hebrides, &c. they are manufactured into kelp; an account of which is given under *F. vesiculosus*; and the profit arising from this article of commerce is so great, that Dr. Garnett, in his "Tour through the Highlands", informs us, in the Isle of Mull, small farms on the coasts, which, within these seven years, only paid 40*l.* rent, have risen to 300*l.* a year. There is one other end they seem designed to answer, which, though hitherto but little noticed, is probably of infinitely greater importance than the rest. It was mentioned by Dr. Priestly in his "Treatise on Air," and struck Mr. Stackhouse in the same forcible manner that it does me. The Doctor says that "great quantities of pure dephlogisticated air are given up from the summits of sea plants, which serve to prevent pure water from becoming putrid: the minute

divisions of the leaves in several, and the Papillæ in others, seem to serve a purpose hitherto unattended to."

If, in treating on the Fuci, I have carried my remarks farther than I at first intended, I must beg the excuse of my readers, who will feel with me that, on a subject so curious and at present so little understood, it is far more easy to begin than leave off. What I have further to urge must be reserved for some other place. I shall now conclude in the words of the last paragraph in Dr. Goodenough and Mr. Woodward's excellent paper; where I feel that those gentlemen express what I wish to say, in terms more forcible, as well as more just, than any which it would be in my power to employ.

"Whatever I have said in this tract, I again beg may be brought to the test of the closest examination. Particularly I wish that gentlemen of science resorting to the sea-side, and especially those who are resident on it, would omit no opportunity of examining the growth of marine plants, their various appearances, and the progress of the parts of fructification. I am confident of nothing, but that I have stated what I have actually seen. In a subject so intricate as this, it would be highly advisable that all prejudices, and

all comparisons and ideas of analogy taken from plants growing on land, should be entirely laid aside. This firmness of thinking led to a better illustration of the natural orders of the genera by the indefatigable Jussieu; to a deeper investigation of the nature and properties of the seeds by the celebrated Gaertner; and of the mosses by the illustrious Hedwig. Why should it be thought impossible that the sub-marine plants, like the animals of that element, should have powers and properties new, original, and peculiar to themselves? The power of GOD is over all his works, and is seen, to the astonishment of man, in the variety of his wonders. But what can equal the satisfaction which he must feel, to whose patient and unwearied observation the discovery of this hitherto latent process shall be made manifest? What labour would not be well repaid by the discovery of another chain of reasoning, leading us to a farther confirmation of the existence and operations of the eternal Godhead?"

YARMOUTH, MAY 1, 1802.

SYNOPSIS SPECIERUM.

Foliis distinctis.

- 1...F. SINUOSUS.—Caule tereti ramofo; foliis oblongis undulatis sinuoso-pinnatifidis, marginibus ciliatis, ciliis lineari-lanceolatis compressis feminiferis.
- 2...F. SANGUINEUS.—Caule tereti ramofo; foliis petiolatis simplicibus ovato-oblongis undulatis integerrimis; tuberculis pedunculatis globosis mucronatis.
- 3...F. RUSCIFOLIUS.—Caule ramofo alato; foliis oblongo-ovalibus obtusis planis integerrimis proliferis; venulis diaphanis catenatis; tuberculis globosis sessilibus.
- 4...F. HYPOGLOSSUM.—Caule ramofo alato; foliis lineari-lanceolatis planis integerrimis proliferis; venulis reticulatis; tuberculis globosis sessilibus.

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- 5...F. PALMETTA.—Caule tereti sub-simplici; apicibus in folia enervia multifido-palmata expansis; tuberculis feminiferis segmentis extremis infidentibus.
- 6...F. MEMBRANIFOLIUS.—Caule tereti ramoso; apicibus in folia enervia sub-biloba expansis; tuberculis feminiferis e caule pedunculatis.
- 7...F. OVALIS.—Fronde filiformi sub-compressa vagè ramosa; ramis uniformibus; foliis ovali-oblongis carnosiss integerrimis, superioribus confertis.
- 8...F. TENUISSIMUS.—Fronde filiformi ramosissima; ramis alternis capillaribus acutis; foliis utrinque attenuatis tuberculiferis: tuberculis ovato-oblongis.
- 9...F. DASYPHYLLUS.—Fronde filiformi tereti ramosa; ramis sub-simplicibus; foliis cylindricis basi attenuatis sparsis proliferis.
- 10...F. OBTUSUS.—Fronde cartilaginea filiformi compressa decomposito-pinnata; foliis cylindricis sub-oppoſitis patentibus obtusissimis truncatis.
- 11...F. NATANS.—Fronde filiformi compressa lenta bipinnata; foliis oblongo-lanceolatis serratis; vesiculis globosis pedunculatis sparsis; pedunculis planis dilatatis.

12...F. BACCIFERUS.—Fronde tereti filiformi rigida ramosissima; foliis lineari-lanceolatis ferratis, vesiculis globosis pedunculatis numerosissimis, pedunculis teretibus.

Foliis unitis.

13...F. SILIQUOSUS.—Fronde compressa ramosa; foliis distichis alternis integerrimis; vesiculis pedunculatis oblongis cavis: filiquis lanceolatis solidis.

14...F. ABROTANIFOLIUS.—Fronde filiformi compressa bipinnata; ramulis extremis vesiculosis, vesiculis innatis ellipticis, terminatis foliolis multipartitis tuberculatis.

15...F. DISCORS.—Fronde tereti ramosa; foliis lineari-lanceolatis ferratis alternatim pinnatifidis, summis capillaribus, apicibus multifidis ovatis tuberculatis.

16...F. MUCRONATUS.—Fronde tereti ramosissima; ramis filiformibus spinosis, extremis vesiculosis; vesiculis innatis lanceolatis moniliformibus, terminatis mucrone simplici tuberculato.

17...F. BARBATUS.—Fronde tereti inermi ramosissima; ramis filiformibus, apice tuberculiferis; tuberculis in filiquam ovatam cuspidatam congestis.

- 18... F. SELAGINOIDES.—Fronde tereti ramosissima; ramis paniculatis spinosis; spinis alternis subulatis basi tuberculiferis sub-tetraftichis, superioribus densè imbricatis.
 - 19... F. TAMARISCIFOLIUS.—Fronde tereti ramosissima; ramis filiformibus spinosis, extremis vesiculosis; vesiculis subrotundis innatis, terminatis spinis subulatis basi tuberculiferis.
 - 20... F. FIBROSUS.—Fronde inermi ramosissima; vesiculis subrotundis moniliformibus innatis; foliis integerrimis, inferioribus lineari-lanceolatis, superioribus setaceis.
 - 21... F. LIGULATUS.—Fronde plana avenia sub-cartilaginea bipinnato-ligulata; ligulis oppositis, extremis lineari-lanceolatis spinosodentatis.
- Alati, s. fronde plana stipite medium folium percurrente.*
- 22... F. ESCULENTUS.—Fronde simplici indivisa ensiformi stipitata; stipite pinnato; pinnis distichis oblongis aveniis.
 - 23... F. SERRATUS.—Fronde lineari dichotoma ferrato-dentata; apicibus bifidis planis, sterilibus obtusis, tuberculiferis acutis.
 - 24... F. VESICULOSUS.—Fronde lineari dichotoma integerrima; vesiculis globosis innatis

axillaribusque; apicibus bifidis, sterilibus planis, tuberculiferis tumidis.

25...F. CERANOIDES.—Fronde sub-dichotoma lineari integerrima sparsim pinnata; pinnis multifidis sub-radiatis, apicibus tuberculiferis lineari-lanceolatis tumidiusculis acuminatis.

26...F. MEMBRANACEUS.—Fronde lineari dichotoma membranacea punctata diaphana tenerrima; nervo undulato sparsim prolifero.

27...F. ALATUS.—Fronde membranacea tenerrima sub-dichotoma; laciniis alternis decurrentibus; tuberculis globosis sessilibus.

Fronde plana enervi.

28...F. DENTATUS.—Fronde membranacea ramosa sub-enervi alternatim-pinnatifida; ramulis linearibus apice incis, lacinulis acutis; fructu racemoso.

29...F. LACERATUS.—Fronde membranacea tenerrima sub-venosa ramoso-dichotoma; ramis linearibus obtusis, marginibus crispo-lacinulatis undulatis; tuberculis immerfis.

30...F. LACINIATUS.—Fronde sub-membranacea ramosa; ramis dilatatis palmatis obtusis, marginibus planis.

- 31...F. BIFIDUS.—Fronde membranacea dilatata sub-dichotoma, marginibus conglutinatis; tuberculis marginalibus sparsis.
- 32...F. CILIATUS.—Fronde sub-membranacea pinnato-ramosa superficie marginibusque ciliata; ciliis sub-simplicibus patentibus subulatis apice globuliferis.
- 33...F. PALMATUS.—Fronde membranacea utrinque glabra palmata: segmentis oblongis sub-simplicibus.
- 34...F. EDULIS.—Fronde carnosae cuneiformi sub-simplici utrinque glabra, apice rotundato, marginibus integerrimis.
- 35...F. FASCIA.—Fronde sub-coriacea simplici lineari utrinque attenuata undulata integra exstipitata.
- 36...F. PHYLLITIS.—Fronde membranacea tenerima simplici lineari-lanceolata integra stipitata; stipite compresso brevi.
- 37...F. SACCHARINUS.—Fronde cartilaginea simplici ensiformi stipitata; stipite tereti rigido.
- 38...F. DIGITATUS.—Fronde cartilaginea palmata stipitata; laciniis ensiformibus; stipite tereti; radice fibrosa.
- 39...F. BULBOSUS.—Fronde palmata, laciniis ensiformibus: stipite plano, marginibus inferne undulatis: radice inflato-bulbosa exasperata.

- 40... F. RUBENS.—Fronde sub-membranacea dichotoma catenato-prolifera; ramis ellipticis; ramulis apice dilatatis bifidis.
- 41... F. NORVEGICUS.—Fronde cartilaginea dichotoma; ramis linearibus integris, apice rotundatis: tuberculis hemisphæricis disco insidentibus.
- 42... F. CRISPUS.—Fronde cartilaginea dichotoma crispo-undulata; ramis dilatatis integris: tuberculis solitariis sparsis immerfis hinc concavis.
- 43... F. MAMMILLOSUS.—Fronde cartilaginea dichotoma hinc canaliculata; ramis dilatatis integris utrinque mammilloso-tuberculiferis.
- 44... F. CANALICULATUS.—Fronde lineari dichotoma integerrima hinc canaliculata fastigiata; apicibus bifurcis, tuberculiferis oblongis obtusis tumidis.

Fronde compressa.

- 45... F. LOREUS.—Fronde dichotoma lineari acuta glabra undique utrinque tuberculata, basi pezizæformi.
- 46... F. NODOSUS.—Fronde sub-dichotoma; foliis distichis pedunculatis subrotundis integerrimis seminiferis; vesiculis innatis solitariis fronde latioribus.

- 47...F. PYGMÆUS.—Fronde cartilaginea dichotoma apice dilatata palmata : tuberculis globosis terminalibus apice pertusis.
- 48...F. ACULEATUS.—Fronde cartilaginea filiformi ramosissima; ramis linearibus spinosis; spinis marginalibus subulatis erectis.
- 49...F. PINNATIFIDUS.—Fronde cartilaginea ramosa; ramis sub-alternis decomposito-pinnatifidis; ramulis obtusis callosis; tuberculis sessilibus ovatis.
- 50...F. CORNEUS.—Fronde cartilagineo-cornea ramosissima; ramis utrinque attenuatis sub-bipinnatis; pinnis oppositis patentibus obtusis apice tuberculiferis.
- 51...F. GIGARTINUS.—Fronde cartilaginea lineari sub-dichotoma; ramis acutis spinosodentatis; dentibus subulatis horizontalibus: tuberculis globosis sessilibus.
- 52...F. CARTILAGINEUS.—Fronde cartilaginea decomposito-pinnata infernè nuda; pinnis horizontalibus alternis sub-linearibus, extremis brevissimis obtusis apice tuberculiferis.
- 53...F. CORONOPIFOLIUS.—Fronde cartilaginea ramosissima; ramulis multifidis subsecundis linearibus: tuberculis globosis pedunculatis; pedunculis distichis brevissimis.

54...F. COCCINEUS.—Fronde membranaceo-cartilaginea ramosissima; ramulis subulatis alternatim secundis: tuberculis globosis sessilibus.

55...F. PLUMOSUS.—Fronde sub-cartilaginea ramosissima; ramis supra-decomposito-pinnatis; ramulis oppositis, apice tuberculiferis: tuberculis maturis quadrifidis.

Fronde tereti.

56...F. TOMENTOSUS.—Fronde teretiuscula æquali tomentosa dichotoma obtusa.

57...F. TUBERCULATUS.—Fronde filiformi sub-dichotoma inæquali; dichotomiarum angulis obtusiusculis: apicibus tuberculiferis oblongis obtusis.

58...F. ROTUNDUS.—Fronde filiformi dichotoma fastigiata; dichotomiarum angulis subrotundis, apicibus bifurcis acutis: verrucis seminiferis difformibus lateralibus.

59...F. LUMBRICALIS.—Fronde filiformi dichotoma fastigiata; dichotomiarum angulis acutis; apicibus seminiferis lineari-lanceolatis teretibus.

60...F. PLICATUS.—Fronde cartilagineo-cornea filiformi ramosissima; ramulis subsecundis implicatis confertissimis: tuberculis lateralibus terminalibusque.

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- 61...F. CONFERVOIDES.—Fronde filiformi
ramosissima; ramis ramulisque sub-secundis
utrinque attenuatis; tuberculis hemisphæricis
lateralibus sessilibus.
- 62...F. FLAGELLIFORMIS.—Fronde filiformi
lubrica ramosa; ramis distichis sub-alternis
in longum protensis sub-simplicibus nudis
truncatis.
- 63...F. FILUM.—Fronde lubrica sub-cartilagi-
nea filiformi simplici utrinque attenuata tubu-
losa intus sub-geniculata.
- 64...F. LYCOPODIOIDES.—Fronde filiformi
ramosa obtecta undique setis; ramis sub-sim-
plicibus; setis apice furcatis squarrosis.
- 65...F. PINASTROIDES.—Fronde filiformi ra-
mosissima obtecta undique setis; ramis apice in-
volutis; setis sub-secundis subulatis simplicibus.
- 66...F. SUBFUSCUS.—Fronde filiformi ramo-
sissima; ramulis sub-alternis subulato-setaceis
brevibus: fructu axillari racemoso.
- 67...F. PURPURASCENS.—Fronde filiformi
ramosissima; ramulis setaceis sparsis: peri-
carpiis sub-globosis gibbosis innatis.
- 68...F. WIGGHII.—Fronde filiformi sub-gela-
tinosa ramosissima; ramulis setaceis sub-simpli-
cibus sparsis apice capsuliferis; capsulis lanceo-
latis mucronatis.

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- 69.--F. ASPARAGOIDES.—Fronde filiformi sub-gelatinosa ramosissima, ramulis subulato-setaceis oppositis apice alternatim tuberculiferis: tuberculis globosis.
- 70.--F. PEDUNCULATUS.—Fronde filiformi pinnato-ramosa; ramis capillaceis tuberculis obovatis sub-pedunculatis apice filamentosis.
- 71.--F. CAPILLARIS.—Fronde filiformi alternatim ramosissima; ramulis sub-distichis subulatis brevibus.
- 72.--F. CLAVELLOSUS.—Fronde filiformi sub-gelatinosa tubulosa ramosissima; ramis ramulisque sub-alternis sub-distichis; tuberculis urceolatis axillaribus.
- 73.--F. KALIFORMIS.—Fronde filiformi sub-gelatinosa tubulosa ramosissima; ramis ramulisque sub-verticillatis articulato-contractis; tuberculis globosis lateralibus.
- 74.--F. ARTICULATUS.—Fronde tubulosa concatenatim-articulata ramosissima; articulis ovato-cylindricis; ramis uniformibus dichotomis verticillatisque.
- 75.--F. OPUNTIA.—Fronde sub-compressa folida concatenatim-articulata ramosissima; articulis obsoletis lanceolatis; ramis horizontalibus acuminatis.

- 76...F. AMPHIBIUS.—Fronde capillari ramo-
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- 77...F. FRUTICULOSUS.—Fronde filiformi
ramosa; ramis alternatim decomposito-pinnatis,
ramulis multifidis setaceis; tuberculis sessilibus
ovatis.
- 78...F. VIRIDIS.—Fronde supra-decomposito-
pinnata; ramis ramulisque omnibus oppositis
capillaceis.

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185	almonensis	185	almonensis
186	barbatus	186	F. barbatus
187	barbatus	187	barbatus
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189	barbatus	189	barbatus
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198	barbatus	198	barbatus
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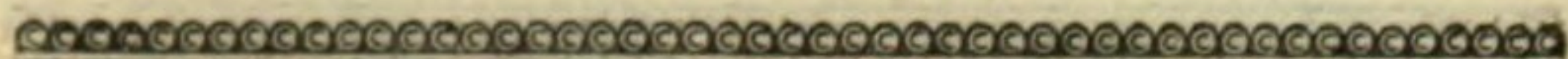
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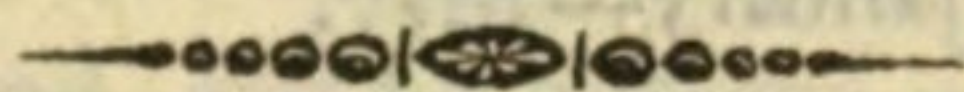
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ERRATUM.

P. 252, l. 14 from the bottom, for *solitaribus*
read *solitariis*.



SYNOPSIS
OF
THE BRITISH FUCI.



1.—FUCUS SINUOSUS.



F. caule tereti ramofo ; foliis oblongis undulatis
finuoso-pinnatifidis, marginibus ciliatis, ciliis
lineari-lanceolatis compressis feminiferis.—

Buddle, p. 26, no. 3.—Uvedale, p. 12, no. 3.

—E. B. t. 822.—Linn. Transf. iii. 111.

Fucus crenatus.—Gmelin, p. 184. t. 24. f. 1.

..... palmettæ var.—Esp. Icon. Fuc. t. 42.

..... roseus.—Fl. Dan. t. 652.

..... rubens.—Fl. Ang. p. 573.—Fl. Scot. p. 943.

—With. iv. 94.—Ner. Brit. p. 18, t. 7.

Fucus membranaceus purpureus latifolius pinnatus.—R. Syn. p. 47.

β . frondibus subcartilagineis, ciliis obovatis.

γ . quercifolius, laciniis rotundatis, marginibus subnudis.

α and β are found among the rejectamenta of the sea at Yarmouth; the former also on the shores of the Isle of Portland and Cornwall; γ was sent by my friend, Rev. Hugh Davies, from North Wales.

Perennial.—January—May.



Root fibrous, throwing out many shoots, at first filiform, but soon expanding; stems cylindrical, short, variously and irregularly branched, serving as midribs to the leaves, and pinnated with numerous lateral branching nerves, of the same substance as themselves, generally opposite; which also, in their turns, become midribs to the marginal shoots, and then again proliferous in an indeterminate series. The length and form of the frond are extremely uncertain; in old plants it sometimes reaches seven inches, but is most frequently found not to exceed three; in the latter case it is but one simple, petiolated leaf, in the former it consists of a stem much divided, pre-

serving every where on both sides the remains of a battered membrane, and clothed with a profusion of sessile shoots.—The shape of the leaves is oblong; in their terminations they vary from acute to blunt, their margin is always sinuated, or rather pinnatifid, the segments extending themselves into new leaves: on all sides, and at all times, they are fringed with a profusion of minute, lineari-lanceolate, compressed processes, serving in the period of fructification as pods to the seeds, which are of a much darker colour than the surrounding frond, and lie disposed in two irregular rows: similar processes in old plants grow copiously from the midrib.—The substance of the leaves is membranaceous, and extremely thin; that of the stem also very tender. The whole is of a transparent rose-colour, changing after it is dried to a darker and more dull red, and in decay to yellow.

β differs in the substance of the frond being somewhat thicker, the colour darker, and the cilia obovate

γ is of smaller size, and has the ends of the segments regularly rounded; in form it strikingly resembles an oak leaf.



This most elegant *Fucus* appears to have been entirely unknown to Linnæus, or at least overlooked by him, if we may judge from his Herbarium, which contains only a miserable fragment of it, fastened to the same sheet of paper with three other extremely dissimilar species, and named at the bottom *Fucus cristatus*. At the same time it must be acknowledged, that his * specific character of *F. rubens* is so strikingly characteristic of the present plant, and so ill agrees with the *F. prolifer* of Lightfoot, that it is impossible to wonder at the mistake into which Hudson and other authors fell upon this subject; or, to speak more correctly, it is impossible not to suspect that Linnæus, whose knowledge of the *Fuci* was unquestionably far from accurate, in this instance erred, and in putting specimens into his Herbarium, mistook his own species. More on this head will be found under *F. rubens*: and as whatever

* *F. caule tereti ramofo, frondibus oblongis undulatis sinuatis*.—Spec. Plant. 1630.—The character of *F. sinuosus* given by Messrs. Goodenough and Woodward is—" *F. caule tereti ramofo, foliis oblongis undulatis ramofo-sinuatis spinoso dentatis*."—Linn. Transf. iii. 111.

may at this time be urged, can unfortunately amount only to presumptive evidence, I have considered myself following the surest road, by treading in the steps of Messrs. Goodenough and Woodward, though in opposition to my own private sentiments. Before however I dismiss the matter, I must be allowed to say, that my friend, Mr. Dillwyn, whose opinion on all cases connected with the Fuci, must, from his accurate and unremitting observations, have great weight, lately in a letter on this subject stated the three following questions, which appear to me decisive: —“Where is the *caulis teres ramosus*, so conspicuous in *F. sinuosus*, to be found in *prolifer*? Can either the epithets of *undulatus*, or *sinuatus*, be applied to *prolifer* with propriety? And, finally, if the description of *F. rubens* in the *Spec. Plant.* was taken from *prolifer*, how could its remarkable dichotomy and proliferous tendency have been overlooked?”—He concludes by giving his opinion, that Linnæus never saw *F. sinuosus*, but adopted verbatim Royen’s description, synonym, and habitat; to which he adds, that Royen’s description is good, but his reference to Martyn’s figure certainly wrong, and that thence arose the confusion, which was perpetuated by Linnæus in his *Herbarium* naming a

specimen of *prolifer* after that wrong-quoted and wretched figure. Gmelin's plate, to which, following all preceding authors on the subject, I have referred, is so bad, that it might almost admit of a doubt whether it belongs to this plant; his description, on the other hand, is accurate and characteristic. Professor Esper's figure is extremely good; but, by singular ill fortune, his specimen of *F. sinuosus* grew together with his *F. Palmetta*, and hence he naturally conceived it to be only a variety of that species. The three first *Fuci* of this division, whose natural affinity to each other is very strong, may be well discriminated by their different fructification; and the compressed cilia, which perform the office of pods in this species, serve also to unite it closely with *F. laceratus*. Its internal structure under the microscope is curious, as it seems then entirely composed of minute cellular cavities, placed extremely close to each other, which in the figure in English Botany are represented so much like seeds, as to give the plant the appearance of an *ulva*. I must confess, that it is still matter of doubt with me, whether the marginal cilia ever extend themselves into new branches; they are observable in a very early stage of the leaves, and appear wholly unprovided with any nerve. This plant differs from its

congeners in the midrib never being proliferous, but the new leaves originating from the lateral membrane.

2.—FUCUS SANGUINEUS.

F. Caule tereti ramofo; foliis petiolatis simplicibus ovato-oblongis undulatis integerrimis; tuberculis pedunculatis globosis mucronatis.

—Herb. Linn.—Linn. Transf. iii. 109.—

Ner. Brit. p. 20. t. 7.—Fl. Ang. p. 573.—

Fl. Scot. p. 942.—With. iv. 94.—Gmelin,

p. 185. t. 24. f. 2.—Esp. p. 79. t. 38.—Fl.

Dan. t. 349.—Linn. Syst. Nat. p. 718.

Fucus, five Alga, folio membranaceo purpureo

Lapathi fanguinei figurâ et magnitudine.—

Morif. Hist. Ox. iii. p. 645. f. 15. t. 8. f. 6.

—R. Syn. p. 47. n. 45.

On the shore at Yarmouth, and in most other parts of England.

Perennial—December—March—Mr. Dillwyn.

Root small, thick, solid, of irregular form; fronds varying in length from six to nine inches, consisting of a short, cylindrical stem, generally about the size of a crow's quill; in its origin simple, but soon irregularly branched, and sometimes a second and a third time divided: these branches at first serve as petioli to the leaves, and afterwards pass through them in the form of a midrib, gradually decreasing in thickness as they approach the termination, and losing by degrees their cylindrical form: they are every where pinnated with dark-coloured prominent nerves, of a similar substance to themselves, but more thin, diverging from them in almost a horizontal direction, and continuing in parallel lines to the margin; simple, except at the extremities, where they are slightly branched. The leaves, which are constantly undivided, vary in shape from lanceolate, through oblong and all the intermediate gradations, to ovate; the termination of different individuals on the same frond, is frequently both very acute and quite obtuse; their length is in general about six inches, their breadth from one to three; their margins are perfectly entire, but always beautifully undulated, which gives the plant, especially when pressed on paper, a most elegant appearance. The fructification consists of minute, roundish,

dark-purple capsules, on short peduncles, terminated by a small sharp point, growing from the stem and midrib of the leaves, not unlike those of *Phascum cuspidatum*, as was justly observed to me by Mr. Dillwyn. The substance of the stem in its first stage is tender, but in age it becomes hard and stiff; that of the leaves is always membranaceous, immediately susceptible of the slightest injury, and finer than the finest gold-beater's skin. Their colour is a beautiful red, perfectly diaphanous, in general faint, but sometimes dark; always deeper after it is dried than when moist; the stem is pale pink and opaque. In decay the plant changes to yellow and white.

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The exquisite beauty of *Fucus sanguineus* has been too often noticed to need any farther mention; its form, texture, colour, undulated margin, and veined leaves always have made it, and always will continue to make it, the delight of those botanists who bestow their attention upon this tribe of vegetables. Although in shape the leaves differ considerably, yet their variations are not of such a nature, as to allow me to consider myself justified in attempting to found upon them any striking varieties; indeed, the only curious cir-



cumstance that ever fell under my notice respecting them, was in a specimen gathered by Mr. Mason, at Yarmouth, the tip of which had probably been broken off in a very early stage, and thence the midrib had become forked, and the end of the leaf consequently bifid, in a manner precisely similar to what often happens in *Asplenium scolopendrium*. It fructifies at a time when few botanists have an opportunity of observing it; and when, unfortunately, it is seldom, if ever, washed upon the Yarmouth shore. For my specimen of it in this state, the only one I ever saw, except that in the Linnæan Herbarium, I am indebted to my friend Mr. Dillwyn, who found it near Dover, and who observed to me on the subject, that he apprehends it is at least a biennial plant, which does not produce fruit till the second year; as during the months of February and March he has seen abundance of capsules, but only on the old and battered midribs, which had lost their surrounding membrane, and were become stems to a profusion of new leaves. There is hardly a possibility of mistaking this *Fucus*, although the petioli vary in being both long and short, simple and branched; the fronds in being both numerous and single; the midrib in being both barren and proliiferous: the latter circumstance I do not appre-



hend to take place except in old plants. Gmelin's figure is admirable. It is to be lamented, that Morison's name of *lapathifolius* was not continued instead of the present, which may equally, and indeed more justly, be applied to several other species.

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### 3.—FUCUS RUSCIFOLIUS.

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F. Caule ramofo alato; foliis oblongo-ovalibus obtufis planis integerrimis proliferis; venulis diaphanis catenatis; tuberculis globosis fessilibus.—Linn. Transf. vi. t. 8.

$\beta$  minor; foliis ovato-lanceolatis, unguicularibus.

$\alpha$  is found among the rejectamenta of the sea at Yarmouth;  $\beta$  at Bognor, Suffex.—Mr. De Luc.

Perennial?—January—February.

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Root between callous and fibrous, throwing out many shoots. Fronds numerous, about two inches long, and four lines wide, rising with a small orbicular leaf, which, as it lengthens,



assumes a form between oblong and oval; flat and entire at its margin; winged from the very base, and pervaded by a dark-coloured, prominent, but compressed midrib, which, near the root, by time and the action of the waves, loses its membranous sides, and thus in full-grown plants takes the appearance of a short, branching stem. This midrib is plainly visible to the very extremities of all the shoots, and produces throughout its whole length a series of smaller leaves, which in shape precisely resemble the first, and in their turns become again and again proliferous: the middle ones are in general longest; but this circumstance is by no means so regular as in the following species. From the midrib, at acute angles, and at short distances from each other, issue series of pellucid colourless veins, intersected at regular spaces by joints similar to the septa of *confervæ*; these in general continue in simple parallel lines to the margin of the leaves, but sometimes branch and anastomose. In a recent plant they may with ease be detected by the naked eye, and give the frond, if attentively examined, a striated appearance; when dry it is necessary to expose the plant to a strong light, and sometimes to use a glass for the purpose of seeing them. The fruit of this species consists of small globular tubercles seated on the



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midrib, chiefly towards the extremities of the shoots, and sometimes three or four on a single leaf; at maturity they burst and fall off, when the minute dark-coloured seeds adhere, as if artificially disposed in two irregular lines, to each side of the nerve. The substance of the leaves is a thin membrane, possessed of considerable elasticity, and rigid, compared with that of *F. Hypoglossum*: their colour is a deep transparent red; the midrib, especially near the root, unless held before a strong light, is so dark as to appear almost black.

β is a singular dwarf variety, with leaves between ovate and lanceolate, hardly more than half an inch long. I describe it from a single specimen given me, many years ago, by Mr. A. De Luc, who gathered it near Bognor.

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Upon the singular and curious system of pellucid veins observable in this *Fucus*, its claim to a place as a distinct species must be considered chiefly to depend; but there are several other by no means unimportant points, wherein it differs from *F. Hypoglossum*, from which no preceding botanist had made it specifically distinct, and with which alone, at least among the hitherto discovered British *Fuci*, there is any probability of its being confounded. Its colour is much darker,

and of a different red, by no means partaking of a pleasant rosy hue, but inclining to the rich tint of the deepest specimens of *F. sanguineus*; its leaves are of an extremely dissimilar shape, and, as far as I have seen, but little subject to variation; at first almost, or entirely, orbicular; and, even when lengthened out into oval or oblong, preserving their rounded ends: nothing can be more unlike than the texture of the two species viewed under a good microscope; the midrib too, of *F. ruscifolius* is far more prominent, as well as more visible, and when highly magnified somewhat resembles a piece of bamboo cane. To these it is to be added, that the months of January and February are those in which this plant bears its fruit; and in which, though occasionally seen at other times, it is most frequently found upon the Yarmouth beach: whereas *F. Hypoglossum* fructifies only in the summer, and never appears at any other part of the year. * In their mode

* All the following part of the description of this *Fucus*, and indeed a considerable portion of the preceding, has already been published by me in the 6th vol. of the Linnæan Transactions; a species of plagiarism that I trust is pardonable.

of fructifying, the two plants completely agree; and, as much has already been written upon that subject, I shall, perhaps, not be blamed, if I venture upon a slight digression respecting it.—The fruit of *Fucus Hypoglossum*, as is well known, is sometimes found in globular capsules situated upon the midrib of the leaves, while in other specimens no traces of these capsules are apparent, but minute dark seeds are discovered in two small rows on each side of the midrib, and parallel to it: a circumstance which with some botanists has given rise to the conjecture, that this *Fucus* may possibly be dioicous, while others have carried the matter so far, as to wish to constitute two distinct species. The latter idea however is done away, by plants being occasionally found in which both kinds of fructification, as they are called, may be discovered upon the same plant; and the former supposition has always appeared to me equally ill-founded, from my once having examined a plant in which the capsule was actually bursting, and the seeds partly discharged. I have no hesitation in owning, that I never could account for these seeds, supposing them to be casually scattered, adhering in such regular lines as is always the case; nor can I see any reason for that part of the membrane upon which they are

disposed being of a darker colour, and apparently thicker substance, than the rest of the leaf. These are difficulties which I hope other botanists will remove, but which do not appear to me of sufficient importance, to induce me to accede to the idea of Fuci being monoicous, or dioicous. I am indeed, on the contrary, persuaded that they prove nothing; as many other Fuci, among which are to be enumerated the following, have their seeds equally contained in capsules, and afterwards dispersed upon the frond, though without the same appearance of regularity: these are *Fucus alatus*, *ovalis*, *obtus*, *dasyphyllus*, *articulatus*, *kaliformis*, *clavellifolius*, *tenuissimus*, and *pinnatifidus*. From a consideration of these and other circumstances, I have been led to conjecture, that in the above-mentioned Fuci, the capsules, when mature, burst, and immediately die away; while the seeds, from that viscidness which they are known so eminently to possess, adhere to the surface of the frond, till, upon the whole plant, at the end of autumn, passing into decay, they attach themselves to the stems of the larger species, or rocks, as the force of the sea carries them, and there remain fixed, till the latter months of the following spring again awake their vegetative powers.

4.—FUCUS HYPOGLOSSUM.

F. caule ramofo alato; foliis lineari-lanceolatis planis integerrimis proliferis; venulis reticulatis; tuberculis globosis feffilibus.—Linn. Transf. ii. p. 30. t. 7. and iii. p. 113.—With. iv. p. 95.

Fucus lingulatus.—Solander in Herb. Bankf.

β . minor; foliis sub-lanceolatis brevibus.

Fucus hypoglossoides.—Ner. Brit. p. 76. t. 13.

γ . foliis linearibus, angustissimis.

α is rarely met with on the beach at Yarmouth, and has been gathered at Dover by Mr. Dillwyn.

— β grows in Cornwall, Mr. Stackhouse.—

γ near Anglesea, Rev. H. Davies.

Annual?—June—August.

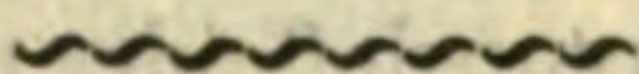
Root a minute disk, fronds numerous, from two to three inches long, and about the same number of lines wide; rising at first with a single, undivided leaf, winged from the very base, but, as the plant advances in age and size, the lower part of the midrib, from the constant attrition of

the waves, loses, though seldom entirely so, its lateral membrane, and thus takes the appearance of a cylindrical, branching stem. The leaves vary much in shape, being sometimes completely lanceolate, at others approaching to linear, their points more or less acute, but their surfaces always flat, and margins perfectly entire. The midrib, which towards their bases is very conspicuous, soon becomes so faint as to be hardly visible, and in general for two thirds of their length, especially in young shoots, is not perceptible except to a careful examination: along the whole of this is produced a series of smaller leaves, at first of a lanceolate shape, similar in every respect, except magnitude, to those from which they spring; the lowest always longest, and gradually decreasing in size as they advance: eight of these sometimes originate from one leaf, and in their turns become again and again proliferous in the same manner, thus forming the ramification of the plant. The fructification consists of minute, globular tubercles, sessile on the midrib, especially towards the ends of the leaves, often four or five on each, of a dark-red colour, and full of numerous, round seeds, which, when the capsule bursts, adhere to the frond, appearing to the naked eye as if they were disposed in two almost regular lines,

but, if viewed with a glass, they will be found nearly to cover a small piece of the frond of a lanceolate shape on either side of the midrib. The substance of the whole plant is extremely tender; that of the leaves a wonderfully thin and delicate membrane. They are of a pleasant, transparent rose-colour, changing in decay to a white, tinged with yellow. Hardly any species adheres more firmly to paper.

β differs much in habit; is in all its parts considerably smaller; has the leaves somewhat clustered, but little more than half an inch long, or a single line wide.

In γ , on the other hand, the leaves extend to near two inches, but their width is scarcely half a line, and they are linear from their very origin.



Under the preceding species sufficient has already been said upon the fructification of this Fucus, and the leading points that distinguish these two so nearly-related plants; one thing more, however, remains to be noticed, which is the reticulated appearance exhibited by *F. Hypoglossum* when viewed under a powerful microscope, a circumstance that had not previously been mentioned by any author, whence my friend,

Mr. Stackhouse, conceiving it only to exist in the Cornish variety, the β of this work, founded upon it a new species, under the name of *F. Hypoglossoides*. A strong glass is necessary to the investigation of the curious internal structure of this delicate species, the membranous leaves of which, so examined, exhibit an appearance, which, except in colour, is not dissimilar to that of young plants of *Conferva reticulata*; as they seem entirely composed of pellucid veins constantly anastomosing, and so forming small, irregularly hexagonal meshes: differing widely in that respect, not only from *F. ruscifolius* and *F. alatus*, between which, in a natural disposition of the genus, this plant must hold an intermediate place, but from every other known British species. As Mr. Stackhouse has made the character of his *F. hypoglossoides* to depend almost solely upon these reticulations, which are common also to all the other different appearances of *F. hypoglossum*, I have little doubt but he will agree with me in considering it as not specifically distinct, though both its smaller size and general habit make it a remarkable variety. Still more remarkable is the Welsh plant sent me by my obliging correspondent, Rev. Hugh Davies, who in one of his letters informed me that this species

is found on those coasts under no other appearance: that which we gather at Yarmouth is equally constant in habit, and I am not qualified to say if there exist any intermediate gradations, not having at present been fortunate enough to receive specimens from other shores except Dover. Neither Gmelin, nor any foreign author, appears to be acquainted with it.

5.—FUCUS PALMETTA.

F. caule tereti sub-simplici; apicibus in folia enervia multifido-palmata expansis: tuberculis seminiferis segmentis extremis infidentibus.
—Esp. p. 84. t. 40. (exclusis synonymis omnibus.)—Ner. Brit. p. 102. t. 16.

On the Cornish coast; frequently on the large stems of *F. digitatus*.—Mr. Stackhouse.

Perennial?

Root between solid and fibrous, common to a great number of fronds, that rise to the height of almost three inches, one of which, in perfect plants, is occupied by a cylindrical stem, about the size of small twine, frequently undivided, and at most not above once or twice dichotomous; gradually becoming compressed, and expanding into flat, widely cuneiform leaves, which are either quite simple, except that the apices are crenate with incisions more or less deep, so as to exhibit somewhat of a ciliated appearance, or multifidopalmate, with segments which are sometimes long, linear, and simple; at others short, dilated, and again divided in a similar manner: the extreme shoots in perfect specimens are little more than one line wide, but nine or ten long; quite linear, and contain the fructification, which consists of small, globular tubercles, seated upon the surface of the frond, generally near the margin, bursting in maturity, and losing their upper half, so as to take, in some measure, the appearance of the shields of Lichens; at the bottom of which, and on the adjacent part of the leaf, the seeds, which are very minute, may be easily discovered. The substance of the stem is a tender cartilage, that of the leaf a thin membrane; the colour of both a pleasant sub-diaphanous red, mostly pale, but

sometimes so deep as to rival the rich tints of carmine.

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This Fucus, for specimens of which I am indebted to my friend, Mr. Stackhouse, the only British botanist, I believe, who has ever found it, both from its substance and mode of fructifying, is well qualified to connect the preceding and subsequent species; though, if considered as to its general habit, and mode of growth, its affinity with the latter must be acknowledged to be far stronger than with the former; and indeed so strong, that, were it not for the widely different fructification, it would in all probability long have been overlooked as a variety. An attentive observer will, however, find many other points of dissimilarity, especially in the colour, manner of branching, and substance, all of which have been particularly mentioned in the specific character, so that there can be no necessity again to enlarge upon them. It is hardly possible that Gmelin's *F. Palmetta*, (p. 183. t. 22. f. 3. and t. 23.) either considering his description or figure, should be the same as this species; and still less similarity is there with Ginanni's *Palmetta marina*, (t. 19. n. 37.) which in all probability is copied



from a tattered plant of *F. sinuosus*: the *F. Palmetta* Flor. Dan. is beyond all doubt to be referred to *F. membranifolius*. Under this confusion, I have held it best to follow Professor Esper and Mr. Stackhouse, though in opposition to one of Linnæus' rules, their figures being so good that the plant they mean can never be mistaken by any botanist that has once met with it. I suspect, but, having seen only a very few specimens, can give it merely as a suspicion, that the long terminal segments of this *Fucus* are designed solely to contain the tubercles: a conclusion certainly not warranted by analogy, but which I have been induced to form from their being wanting in the specimen figured in the *Nereis Britannica*, and in all others, except that which he sent me in fruit. Dr. Esper observes, that hardly any species is subject to so many variations of appearance; and, if all he has drawn and quoted as synonyms were really only varieties of *F. Palmetta*, his remark would be assuredly well founded; as it is, I cannot but suspect that the reverse is the case. Under *F. sinuosus* I have already mentioned, that his t. 42, and, I might have added, part of the lower figure of his t. 40, belongs to that species.





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6.—FUCUS MEMBRANIFOLIUS.

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F. caule tereti ramofo; apicibus in folia enervia sub-biloba expansis; tuberculis feminiferis e caule pedunculatis.—Linn. Transf. iii. p. 120. t. 16. f. 1.

F. Palmetta.—Fl. Dan. t. 827.

β. lacer; foliis dichotomis, segmentis linearibus, apicibus acutis.—Buddle, p. 27. n. 1. 4.

Fucus ceranoides, var. γ.—Fl. Ang. p. 583.—Fl. Scot. p. 915.

..... membranifolius. var. γ.—Linn. Transf. iii. p. 120.

..... pseudo-ceranoides.—Gmel. p. 119. t. 7. f. 4. (excl. syn. Morif.)

..... parvus, cauliculis teretibus, summitatibus membranaceis dilatatis et laceris.—R. Syn. p. 44. n. 19. (excl. syn. Morif.)

..... frutescens, foliis angustis se sensim ad extrema dilatantibus. Mor. Hist. Ox. iii. p. 648. f. 15. t. 9. f. 2.

γ. stellatus; foliorum apicibus tenuissimè divisis, numerosissimis.



♂. fimbriatus; foliis ciliatis.—Linn. Transf. p. 121.  
t. 16. f. 2.

Fucus fimbriatus.—Fl. Ang. p. 574?

..... ceranoides. var. ♂.—Fl. Scot. p. 916.

$\alpha$  and  $\beta$  are not uncommon both on the eastern and western shores of England.— $\gamma$  at Dover, Mr. Dillwyn; and Weymouth.—♂ near Aber, Rev. H. Davies;—and at Cromer, Norfolk.

Perennial—October—January.



Root an expanded disk; fronds numerous, often reaching a foot in length, rising with a naked cylindrical stem, entire towards the base; at the distance of an inch or two from which, it generally throws out a few short branches, and soon becomes divided into several others of nearly equal length, cylindrical like itself, and again subdivided in a dichotomous manner; except the extremes ones, which are fasciculated, frequently five or six growing in a cluster: of these, some few preserve their cylindrical form to the extremities; but, in general, the ends are dilated into obcordate, thin, membranous leaves, from half an inch to an inch long, and about the same breadth at the summit; most frequently only emarginate, or bilobed, with blunt terminations;



but sometimes twice or thrice divided; the angles of the divisions so obtuse as to be almost divaricated, and the tips extremely short: similar ones also grow, but by no means constantly so, from the sides of the upper part of the stem. Dark, blood-red spots, of an oblong, or triangular form, much thicker in substance than the leaves, are often observable at their bases, most probably caused by some insect, but having no connection with the fructification, which consists of small, pale, pellucid, ovate tubercles, on very short peduncles, scattered over the cylindrical part of the branches, particularly the extreme ones. The colour of the stem is dark brown; of the leaves much lighter, with more or less of a strong tinge of red, frequently a fine pale-pink at the tips; passing in decay, or when much exposed to the sun, into a light green, and sometimes white. Their substance, though thin, is almost horny.

In  $\beta$ , which is by far the most common appearance of this Fucus, the leaves are dichotomous, with linear segments; the angles of the divisions more or less rounded: the summits bifid, with short, acute terminations.

$\gamma$  approaches nearly to the stellated appearance of *F. crispus*; and, like that, has its stem but little divided; its leaves once or twice dichoto-



mous with slightly-expanded segments, the ends of which are cut into a great number of very minute, short, and narrow tips.

The leaves of  $\delta$  are every where fringed with a profusion of minute, oblong cilia, generally entire, but sometimes forked: in other respects it resembles  $\beta$ .



Unlike as this Fucus is in its general appearance to every other, except Palmetta, it is not to be denied that specimens of it are occasionally found, bearing so strong a resemblance to some of the varieties of *F. crispus*, that, unless in fruit, it is difficult to point out any sufficiently marked specific distinction. The termination of the branches in both species is liable to extreme changes; and, though I have made only two varieties on this account, I could easily have formed more, had I considered them sufficiently striking, permanent, or important; nor does the roundness of the stem, at all times, present a certain distinction, as even this is occasionally, though rarely, variable, particularly in young specimens; those of *membranifolius* having it sometimes so short as to be hardly perceptible, while in *crispus*, it is often so little compressed, as to be almost cylindrical. The thin, almost horny nature of the



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leaves affords a much better, and more constant mark. Messrs. Goodenough and Woodward's var.  $\beta$ , I have felt myself under the necessity of omitting, having found the dark spots, which they consider the leading characteristic of it, very uncertain, and never present on all the leaves of the same plant: there is a singularity attending these spots, which makes the carefully watching their progress well worthy the attention of every botanist, who has it in his power to do so; and who, in the pursuit of the science, aims at uniting the philosophy of natural history with its nomenclature. My attempts to detect their nature, by examining thin slices of them, have hitherto been baffled by their impenetrable opacity; and all I have been able to discover is, that their internal substance is quite different from that of the rest of the frond. The synonymy of this *Fucus*, from its having been almost always confounded with other species, is wrapped in extreme obscurity. Gmelin's *F. Palmetta*, which Hudson has quoted, appears to me at best a doubtful reference; and, both from the figure and description, I am rather inclined to think it was copied from some different Mediterranean species. Esper's *F. pseudo-ceranoides* (p. 157. t. 80.) is an extremely dissimilar plant: Withering's *F.*



membranifolius (iv. p. 106.) is merely *F. crispus*, and his variety 2, little more than a translation of Gmelin's account of *F. Palmetta*. It is possible that Ray's n. 16. p. 44. (*F. ovinus* of Gunner) is what I have above described as variety  $\gamma$ ; but, without an opportunity of consulting the *Acta Nidrosensia*, I have not dared to quote it among the synonyms. The figure in the *Flora Danica* is very good; but nothing can be worse than those of Gmelin and Morison, which are calculated merely to puzzle and mislead: their descriptions, on the other hand, are highly characteristic. Never having seen an authentic specimen of Hudson's *F. fimbriatus*, I have taken the liberty of putting a mark of doubt to that synonym; not that I have an idea of any other British *Fucus* which he could intend to describe, but from his having referred to Gmelin's *F. caulescens* (p. 173. t. 20. f. 2.) which is evidently a very dissimilar plant.

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### 7.—FUCUS OVALIS.

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*F. fronde filiformi sub compressâ vagè ramosâ;  
ramis uniformibus; foliis ovali-oblongis car-*



- nosis integerrimis, superioribus confertis.—  
 Linn. Transf. iii. p. 116.—Fl. Ang. p. 573.—  
 With. iv. p. 112.—E. B. t. 711.  
 Fucus sedoides.—Linn. Transf. iii. p. 117.—Reau-  
 mur Act. Gall. p. 40, t. 4. f. 8.—Ner. Brit.  
 p. 67. t. 12.  
 ..... vermicularis.—Gmelin, p. 162. t. 18. f. 4.  
 —Fl. Scot. p. 958.  
 ..... polypodioides.—Gmelin, p. 186.  
 ..... botryoides.—Wulfen in Jacq. Coll. iii.  
 p. 146. t. 13. f. 1.  
 ..... uvarius.—Esp. p. 153. t. 78. f. 1. (excl.  
 syn. Linn.)

On the shores of Dorsetshire and Cornwall not  
 unfrequent.—Scarborough, Hudson.—Isles of  
 Jura, Lightfoot.

Annual—June—July.

Root composed of a few creeping fibres,  
 which at intervals expand themselves into small,  
 callous disks, and produce numerous fronds, that  
 vary in height from three to seven inches: they  
 rise with slightly-compressed, or cylindrical stems,  
 about the thickness of common twine; in general  
 not more than once or twice dichotomous, and  
 that near the summit, but sometimes much and



irregularly divided: the branches are distant from each other, and dispersed without order; of the same substance as the stems, naked towards their bases, or supplied only with a few scattered fleshy leaves, which increase in number towards the summits, and are there thickly clustered. In their origin they are almost globular; but, when mature, their form is cylindrical, more or less swelling into oval, their apices slightly rounded; always entire, and very much attenuated at their lower ends, so as to have, when dry, the appearance of being petiolated. Their shape and size, even on the same plant, are liable to extreme variations; the inferior ones being occasionally half an inch long, between cylindrical and lanceolate, while the upper ones hardly extend to a line in length, and are quite oval. Upon the whole of them promiscuously is produced the fructification, consisting of dark-brown, minute, sessile, globular capsules, full of very small seeds, which, when the tubercles disappear, remain attached to the surface of the frond. The substance of the stems, in fresh plants, is cartilaginous, and somewhat rigid, but soon becoming gelatinous; the leaves are very tender. The colour is a reddish brown, changing in decay to white, or light-green.





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It is with extreme regret that I differ from the learned and worthy authors of "Observations upon the British Fuci," with regard to this beautiful species; and I beg it to be understood, that, though I adopt the opinion which my own observations in its place of growth, and all the specimens I have hitherto had an opportunity of examining confirm, I submit my sentiments to the decision of those who are better judges than myself, with all due humility; by no means looking upon it as impossible, or even improbable, that a more enlarged view of the subject may induce me to alter them. At the same time, for my own justification, it is to be observed, that, in considering *F. sedoides* and *ovalis* the same, I tread in the steps of Mr. Hudson, whose acquaintance with the marine Algæ was, unquestionably, so extensive, that the loss sustained by this branch of botany, from the destruction of his Herbarium, cannot be sufficiently lamented. Lightfoot, also, has given an excellent description of this plant, and well compares it to *Sedum album*; but, unfortunately, he appears to have met with it only after it was in a measure bleached; and, from his observation that "the leaves are sometimes found bifid," as well as from what he says of the colour, it cannot but be suspected that he did not with sufficient accuracy



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discriminate between the present *Fucus*, and *F. dasyphyllus*, which he has not noticed, but which is infinitely more common. Gmelin's error in describing it twice under different names, evidently arose from the two specimens he received being unlike in colour; and the latter (*polypodioides*) in a dried state, whence he naturally supposed the substance to be membranaceous. From the same cause, \* Dr. Esper has concluded it to be the *F. uvarius* Linn. and as such figured it; a conjecture which, without the advantages we possess in England, would appear by no means improbable; though, from authentic specimens, it is now known to be unfounded: and it is

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\* There is reason to believe that Baron Wulfen also confounded together this plant, and the zoophyte, called by Linnæus, *F. uvarius*, as will be seen by any botanist who attentively reads his description, especially the following passage:—"Deficcatum idcirco si quis *Fucum* hunc intueatur, nullas in eo conspiciet vesiculas; subtilia duntaxat in eo se videre credat foliola, aquosè flavescientia, diaphana, sessilia, subovata, clypei-feu scuti-formia, supernè convexa, infernè fornicato-concava, margine integerrima."



somewhat singular, that, on the same plate, f. 2, 3, 4, 5, and 6, he has exhibited what Linnæus really meant for *F. uvarius*, which is a zoophyte, a circumstance that had not escaped the notice of the learned Professor. The connection between *F. ovalis*, and the three following species, with which it forms an extremely natural family, is very strong, both in habit, texture, and fructification: its mode of ramification, however, is dissimilar; but the most constant mark is afforded by the leaves, which, as far as I have seen, are always entire, however variable in shape; indeed so variable, even on the same specimen, that I have not hazarded the establishment of a single distinct variety upon them.

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#### 8.—FUCUS TENUISSIMUS. \*

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*F. fronde filiformi ramosissimâ; ramis alternis capillaribus acutis; foliis utrinque attenuatis tuberculiferis; tuberculis ovato-oblongis.*—Linn.

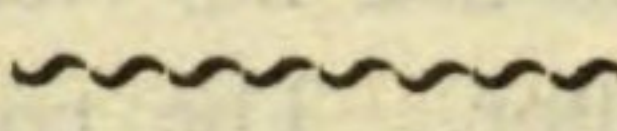
Transf. iii. p. 215. t. 19.—With. iv. p. 117.

*Ulva capillaris.*—Fl. Ang. p. 571.



At Weymouth, Mr. Bryer.—Cornwall, Mr. Stackhouse.

Annual—May—October.—Hudson.



Root fibrous; stems filiform, cylindrical, very numerous, from six inches to a foot high, pinnated at a short distance from the base, and throughout their whole length, with a series of extremely acute, capillary branches, alternately arranged, the central ones in general longest, and in full-grown specimens themselves pinnated in a similar manner: the youngest shoots always furnished with minute, cylindrical leaves, two or three lines long, alternate like the branches, of which they are in reality only the rudiments, tapering at each end, for the most part simple; or, to speak more correctly, not beginning to be proliferous till they are grown so long as to lose all claim to the name of leaves. Upon these are placed the tubercles, often three or four on each, sessile, of a form between ovate and oblong, about the size of poppy-seed; transparent, and not differing in colour from the rest of the plant. When they decay, the seeds that they contain adhere to the surface of the leaves. The substance of this Fucus is tender and cartilaginous, but approaching nearly



to gelatinous: its colour a pale diaphanous red, soon changing to white.



I have been under the necessity of describing this plant from a dried specimen; nor was I ever fortunate enough to find it in a perfectly recent state, although, through the kindness of Mr. Stackhouse, and Mr. Bryer, I have more than once had opportunities of examining it, when it had only been so slightly pressed, as, immediately upon immersion, to recover its natural form and habit. Its connection with the preceding and following species, especially the latter, is so great, that I cannot suffer myself to admit a doubt of the propriety of placing them together, as well in a natural as an artificial arrangement of the genus, established on the principles which it is my intention to follow. This Fucus is strikingly distinguished from its congeners; not only by the alternate disposition of all its parts, and its long capillary branches, regularly tapering from base to summit, but even more forcibly by the form of its leaves; an attention to which, will enable a skilful observer, at first sight, to discriminate between three plants so nearly allied as *F. tenuissimus*, *dasyphyllus*, and *obtusifolius*; those of the first being remarkably attenuated at either end; of the



second, acute only at their insertion, and obtuse or rounded at their extremity; of the third, obtuse at both. There is hardly a possibility of its being confounded with any other species; for *F. asparagoides* and *pedunculatus*, adjoining which Messrs. Goodenough and Woodward have placed it, and from which they have carefully pointed out its differences, are, as they have observed, widely dissimilar in habit, fructification, and other circumstances. It is little to be wondered at, that Hudson arranged this plant among his *ulvæ*, especially when it is considered that he did the same with *F. articulatus*; and, after all that may be said on the subject, it must be owned, that the characters of these two genera are at present but imperfectly established, so that, as with the Linnæan arrangement of the ferns, the same species, in different stages of its fructification, belongs to both one and the other genus.

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### 9.—FUCUS DASYPHYLLUS.

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*F. fronde filiformi tereti ramosâ; ramis simplicibus; foliis cylindricis basi attenuatis*



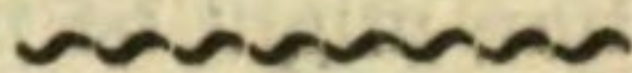
sparsis proliferis.—Linn. Transf. ii. p. 239.

t. 23. f. 1, 2, 3.—iii. p. 119.

Ulva rubens.—Fl. Ang. p. 571?

Among the rejectamenta of the sea at Yarmouth,  
and on the rocks at Cromer and Shering-  
ham, Norfolk.—Weymouth, Mr. Bryer.—  
Cornwall, Mr. Stackhouse.

Annual—June—September.



From a minute, expanded base arise many stems, cylindrical, filiform, rarely reaching half a foot in length, tapering at each extremity, and, when old, frequently remarkable for a singular jointed appearance, much resembling some specimens of *Conferva rubra*: these are clothed throughout with branches, placed without regularity, in a somewhat distichous manner, varying at their origin from patent to horizontal; those nearest the root longest, and often equalling the main stem; the rest gradually shortening so as to give the outline of the plant, when floating in water, an almost triangular appearance. In very old specimens, the lower branches become again divided; but, in general, these as well as the others, are simple, and only bear numerous, scat-



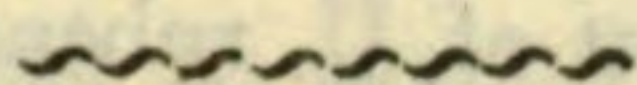
tered, cylindrical leaves, very much attenuated at their infertion, but rounded and blunt at the extremities, almost globular in their earliest stage, but soon taking an oblong form, and, when perfect, proliferous with one or two smaller leaves, similar in every respect to themselves. To say any thing about the length of these would be vain, as they depend entirely upon the age of the plant, and would in time lengthen into branches, so that a just objection might be made to the term, which I have, nevertheless, retained; conceiving that a botanist, who had never seen the *Fucus* before, will understand me better than if I were to call them extreme ramuli. The substance is between gelatinous and cartilaginous, more tender than that of *F. obtusus*; the colour pale red, tinged with brown, darkest when the plant is dry, and so very fugitive, that specimens are seldom found in which it has not, in some measure, disappeared. In decay, it turns to a dirty white, or brownish green. \* The fruit consists

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\* On the 16th of September, 1797, Rev. Joseph Alderson, Mr. Pitchford, and myself, found it abundantly, as thus described, on the rocks at Cromer; but, unluckily, I either omitted to pre-



of minute, spherical tubercles on the ends of the leaves, filled with seeds, which, after the decay of the capsules, adhere to the frond, as figured in E. B.: sometimes they are affixed to the stems, as represented by Mr. Woodward; but I have never seen them so, and have Mr. Wigg's authority for saying they are but seldom found there.



So similar is this Fucus in habit and general appearance to the two between which I have placed it, that its having escaped the notice of most authors on the subject is matter of but little surprize: I must, however, be allowed to start a doubt, which, I fear, will find but few supporters; and which is, whether it may not possibly be what Hudson intended for his *Ulva rubens*. I am well aware that a very different plant is known to British botanists, and preserved in most collections, under that name; nor did I ever hear a question entertained upon the subject, by those who were most acquainted with the learned author of the *Flora Anglica*: but, chancing, in

serve any specimens, or have given them all away, so that I now write from memory only:—since that time, I have only seen it with the seeds scattered.



the course of last summer, to examine the relics of his Herbarium, now in the possession of my friend, Mr. E. Forster, jun. I was struck with a specimen of *F. dasyphyllus* among them; and, knowing it to be not uncommon in those parts of England which Hudson was in the habit of visiting, I carefully looked through his descriptions; among which, that of *U. rubens* so much better accords with this species, than with what is usually considered to have been his plant, that I could not refrain from entertaining a suspicion that we have hitherto been in error about it. This suspicion was materially strengthened from his having assigned his *U. rubens* a place immediately adjoining his *U. capillaris*; and from my having been told by a gentleman much connected with him, that, during the latter years of his life, after the destruction of his collection, his memory was so much shattered, that he often did not know his own plants, and gave the same name to two different species, or vice versâ; instances of which have fallen under my own observation. The jointed, obscurely-moniliform appearance which the stem of this *Fucus*, in very old specimens, exhibits, is an extraordinary circumstance, and affords a curious, as well as unexpected instance of the intimate connection between this



genus, and the *confervæ*: in dried plants it is hardly visible; but I once examined a recent one, in which it was so strong that I could not discover whether the frond was not really divided by actual dissepimenta. I have followed the example of my predecessors in placing this species in the present division, to which, in reality, it has no claim, except from its general habit and affinity with *F. ovalis*; for the leaves of that *Fucus* do not lengthen into branches, which those of *F. dasyphyllus* certainly do; yet still, especially after they are pressed, their appearance is so different from that of the stem, and the present arrangement is so conformable to nature, that I have thought it best to retain it, and bring *tenuissimus* and *obtusus* to this division, rather than swell that of "*fronde tereti*," already too disproportionate. This *Fucus* was first found at Yarmouth by Mr. Wigg, and described in the 2d volume of the *Linnæan Transactions* by Mr. Woodward.

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#### 10.—FUCUS OBTUSUS.

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*F. fronde cartilagineâ filiformi compressâ decomposito-pinnatâ; foliis cylindricis sub-oppo-*



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patentibus obtusissimis truncatis.—Fl. Ang. p. 586.—Linn. Transf. iii. p. 191—With. iv. p. 119.

F. spinosus.—Wulfen in Jacq. Coll. iii. p. 156. t. 15. f. 1.—Esp. p. 76. t. 36. (excl. syn. Linn.)  
β fronde teretiufculâ sub-gelatinosâ; foliis obovatis apice rotundatis.

Both varieties are found at Weymouth:—α at Hastings, in Suffex, and in Devonshire.—Hudson.

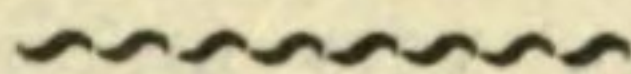
Annual—May—October.—Hudson.

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Root solid, very small, throwing out numerous shoots, which at first creep along the substance to which they are attached, and afterwards rise into fresh plants. Frond in general solitary, varying in length from two to six inches, about the thickness of packthread, compressed and filiform; in its earliest stage, simply pinnated with short, for the most part opposite branches, occasionally, though but seldom, three together; very blunt, so as to appear truncated at their summits, and not attenuated at all, or but slightly so, at the base. These, in time, extend to a length nearly equal to the frond, and bear another series of smaller ones, similar to the leaves of *F. dasyphyl-*

lus, which also sometimes become in their turn proliferous ; and this succession would, according to appearances, continue to be progressive, were it not that, in general, the short duration of the plant allows of no farther increase. * “ The fructification consists of minute, almost black tubercles, situated on the dilated terminations of the leaves, and the sides of the larger, as well as the smaller branches ;” the seeds of which, on their decay, adhere to the surface, as represented by Colonel Velley. The substance of this Fucus is cartilaginous, but, when kept in fresh water, soon becoming gelatinous ; its colour a light-red, also very fugitive, turning, in decay, to a fine pink, and afterwards to a dirty white.

β is thicker in all its parts, and but slightly compressed ; its leaves are longer, and not truncated, but more or less rounded at their extremities.



A stronger instance could with difficulty be found of the inefficacy of language, and particu-

* Never having seen the plant myself in fruit, I borrow this account from the 3d volume of the Linnæan Transactions.

larly of short descriptions, to convey an adequate idea of these vegetables, than that the Baron von Wulfen, in the 3d volume of Jacquin's *Collectanea*, should have supposed this species to have been the *F. spinosus* Linn.; and, that his error should have been universally disseminated through the botanists upon the continent. Both his figure and description are extremely good, and suit well with our plants; besides which, were there any doubt of identity, I have specimens so named, from Professor Esper, Dr. Schrader, and Professor Mertens, some of which in all probability come from the Abbot's own collection, or have at least been compared with it. Esper's figure above quoted, at least n. 1, is not altogether characteristic, and, though his description is certainly taken from the true plant, I cannot help suspecting, that he has confounded *F. dasyphyllus* with it: they are in reality, as I have already said under that *Fucus*, very much alike, especially when recent; the attenuation of the leaves at their insertion, and their irregular disposition in *F. dasyphyllus*, which are the most striking specific differences, not being then so apparent as in specimens pressed to paper. The colour of *F. obtusus* is more pale and beautiful, the leaves more regularly patent, far less frequently proliferous,

their ends much more obtuse. Through the kindness of Mr. Bryer, of Weymouth, they are at this time both fresh before me, and I cannot help altering, in respect to them, the arrangement of former writers, by no longer suffering two so nearly-allied Fuci, to remain so widely distant in situation. It is, however, my var. β , which principally leads me to make this alteration, that being almost as nearly connected with the one as the other species, and holding, both from its habit, leaves, and sub-cylindrical stem, a singularly intermediate place between them. This indeed appears to be the plant which Colonel Velley's elegant figure is intended to represent; and, though the specimen he exhibits, is not so remarkable as some others which I have seen, still it did not escape the acute eye of Mr. Stackhouse, who, in his appendix, observes that it seems to differ from the *F. obtusus* of the Linnæan Transactions. There is, however, in Colonel Velley's plant a peculiarity in the branches and leaves, being much more clustered at the extremities, than towards their bases, no tendency to which I ever observed, in what is commonly known for *F. obtusus*; and this peculiarity is far less striking in his figure, than in a specimen which he had the goodness to give me sometime ago. I should not therefore be

surprized, were it afterwards to prove a distinct species, though I am not sufficiently acquainted with it to give an opinion that it will be so. I am inclined to put but little dependence upon the flatness of the stem, as the Abbé von Wulfen has observed, that, in what he has figured, which is its common appearance, he found it cylindrical; and such was certainly the case in the specimens of my variety β sent me by Mr. Bryer. Colonel Velley remarks, that this species may frequently be known by a powerful perfume which it imparts, not unlike violets. Through the liberality of Sir Joseph Banks, and Mr. Woodward, I have specimens of it from New Zealand, and Scanderoon-Bay, neither of which differs materially, in any respect, from those gathered at Weymouth, where, in June 1799, Mr. Sowerby and I found this beautiful plant in extreme abundance.

11.—FUCUS NATANS.

F. fronde filiformi compressâ lentâ bipinnatâ;
foliis oblongo-lanceolatis ferratis; vesiculis glo-

bofis pedunculatis fparfis; pedunculis planis dilatatis.—Herb. Linn.—Sp. Pl. p. 1628.—Linn. Tranf. iii. p. 107.—Fl. Ang. p. 572.—With. iv. p. 86.—Fl. Fr. i. p. 94.

Fucus fargaffo, var. i.—Gmelin, p. 93.

..... *acinarius*, var.—Esp. t. 66.

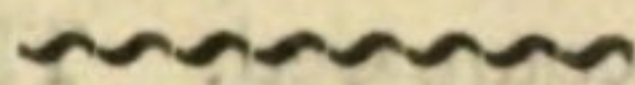
..... *undulatus*.—Linn. Syft. Nat. ed. Gmel. p. 1381?

Fuco Acinara di foglie lunghe, e nella fommità de' rami florido.—Gin. Adr. p. 19. t. 17.

Lenticula marina foliis latis brevibus ferratis.—Mor. Hift. Ox. iii. p. 648. n. 14.

Among the rejectamenta of the fea near Falmouth, Hudfon?

Perennial.



Root an expanded, callous difk; frond from one to two feet long, compofed of a flightly-compreffed ftem, not thicker than fmall twine; pinnated throughout its whole length with fhort, fimple, fub-alternate branches, alfo filiform, and covered with a profufion of oblong, or oblongo-lanceolate, midribbed leaves, their margins irregularly ferrato-dentate, and their furfaces dotted with dark-coloured, mucifluous perforations, fimilar to thofe obfervable in *F. ferratus*, veficu-

lofus, &c. whence what Reaumur considered the male parts of fructification exude. The length, breadth, and form of these leaves is very variable; they are found from almost oval, to oblong and lanceolate; from their alæ is produced the fruit, which consists of numerous, black, cylindrical, pointed pods, each about two lines long, disposed in a panicle, and supported upon a common peduncle; their surfaces tuberculated, and their points sometimes forked. Besides these, hollow, spherical, or oblong vesicles, placed upon short, flat, dilated stalks, and occasionally tipped with a minute point, are scattered, though in small quantities, over the stem and branches, the largest of them almost equalling in size the seeds of *Pisum sativum*, or the berries of juniper, to which they have been well compared. This *Fucus* is very flexible and soft; the substance of the leaves and bladders membranous, thin, and tender; their colour a reddish brown.

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Never having myself either found *F. natans* on the shores of Britain, or seen a specimen gathered there by any other botanist, it is solely upon the authority of those who have preceded me, that I venture to describe it as a native of these kingdoms; and the following their authority



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in this case, has reduced me to a considerable dilemma, which, at least in the present work, I could wish to have avoided. Neither Linnæus, Gmelin, nor Hudson, seems to have had the least idea of separating this species; but, entirely relying upon the serrated leaves, and pedunculated, globular air-bladders, considered every thing they found so provided, to be the same plant, not even allowing themselves to part into varieties, appearances so different, that they must strike even an inattentive observer. I would willingly, for the present, have followed their example, had I known what I was to describe as the British plant; but, being unfortunately ignorant of that, and having repeatedly had opportunities of examining this plant by the kindness of my friends, who sent it from Jamaica, the Mediterranean, and the Bermuda Islands; both Mr. Wigg and I are convinced that there are at least two distinct species, neither of them uncommon; which two I now separate; and as soon as the termination of this undertaking shall allow me leisure to divert my attention, in a measure, from the British to the foreign Fuci, I will avail myself of an early occasion carefully to examine all that I have received under the name of *F. natans*, and will transmit the result of my observations to the Linnæan So-



ciety. I hope it will be considered that I have done right in quoting the synonyms of Linnæus, and some other writers to both the species I have formed, as they have evidently known both, and consequently their descriptions are in part applicable to either. If I have erred in this case, I rest my apology solely upon my ignorance. Morison, and many of the older authors, have set me the example of distinguishing these plants; but, among the more recent botanists, I can find Forskæl alone who has followed them; and even him I quote with doubt, never having seen his work, but deriving my only knowledge of it from what Professor J. F. Gmelin inserts under his name in the 13th edition of the *Systema Naturæ*. I must here observe, that Dr. Esper has given an excellent figure of *F. natans*, as a variety of *F. acinarius*, from which, I should conceive, its serrated leaves sufficiently mark its difference; for, if dependence cannot be placed on that character, all the distinction hitherto supposed to exist between *F. acinarius* and *natans*, falls to the ground. The particular characteristics of the present and following plant I shall reserve for my account of the latter, and shall now confine myself to what has been said of *F. natans* in general; previously, however, noticing, that



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the description of what I have so called, is drawn up from specimens collected in the Mediterranean, where I suspect that it only is found; of the other, from some which were gathered for me upon the shores of the Bermuda Islands. The extreme abundance of *F. natans*, which all voyagers through the Atlantic ocean, the gulf of Florida, &c. meet with, has been too often mentioned, and is too generally known, even to those who are wholly unacquainted with marine plants, to need farther repetition. It even attracted the notice of \* Columbus, as related by Gmelin; and other navigators have again and again expressed their surprize at the quantity, almost exceeding belief, in which they found it. Osbeck (ii. 110.), gives it as his opinion, that its native place is America;

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\* Quum Chr. Columbus (celare enim nefas esset, quod tantam fargasso famam conciliavit) Ao. 1492, investigaret mundum, et ab insulis canariensibus ad occidentalem trajiceret plagam, mare mox tot refertum deprehendebat herbis, ut pratum referret, dicitque herbam esse flavescens instar fœni semificci, folia gerentem rutæ vulgaris, cui adpendantur copiosæ baccæ nigerrimæ, quæ ficcata juniperinas referebant.—Gmel. Hist. Fuc. p. 94.



and observes that, though all he saw was without any appearance of roots, still it was able to push out new leaves for farther increase, a circumstance which appears more remarkable at first sight, than when it is taken into consideration, that the roots of Fuci are supposed to be intended only to fix them to their places of growth, without conducing to their subsistence. The air-bladders, with which all the appearances of this plant are provided, are, as far as I have seen, perfectly empty, and destitute even of the capillary fibres which line the interior coats of *F. vesiculosus*: if put into the fire, they explode with a report little inferior to that produced by the fire-works, known by the name of crackers. It is from them that the plant is able to preserve its wandering existence; and it is to this latter circumstance, that numerous tribes of fishes are indebted for their sustenance; another proof of the wisdom of the Deity in providing for the wants even of his meanest creatures. Kalm relates that, in America, this Fucus is used for medical purposes: Osbeck that, if prepared with vinegar, it is reckoned as good as samphire\*; but these, as well as many other in-

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\* *Crithmum maritimum* Linn.



interesting particulars respecting it, are related by Gmelin in his *Historia Fucorum*, to which I must refer those who are desirous of farther information; having already transgressed my usual bounds, and, I fear, incurred no small hazard of the charge of prolixity. There is no British species with which *F. natans* can be confounded; and, in the midst of our list, it is, properly speaking, a plant "*sui generis*:" yet one which seems admirably well calculated to unite those of the first and second division; as, though in every point of view it strictly belongs to the former, still in habit, substance, and colour, it is more nearly connected with the plants that compose the latter. For this reason I have ventured upon removing it from the first to the last place among the "*Fuci fronde unitâ*." Linnæus, at the end of his description in the *Species Plantarum*, has observed that, if he be not mistaken, this is the most common vegetable in the world.

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## 12.—FUCUS BACCIFERUS.

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*F. fronde tereti filiformi rigidâ ramosissimâ; foliis lineari-lanceolatis serratis; vesiculis globosis*



pedunculatis numerosissimis, pedunculis tere-  
tibus.

*Fucus natans*.—Herb. Linn.—Sp. Pl. p. 1628.—

Linn. Transf. iii. p. 107.—Fl. Ang. p. 572.

—With. iv. p. 86.—Fl. Fr. i. p. 94.—Esp.

p. 49. t. 23.

..... *fargaffo*.—Gmel. p. 92.

..... *denticulatus*.—Linn. Syst. Nat. ed. Gmel.

p. 1381 ?

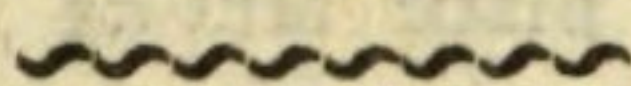
..... *folliculaceus ferrato folio*.—Mor. Hist. Ox.

p. 647. n. 13.

*Lenticula marina vulgaris*.—Park. Th. p. 1281.

Among the rejectamenta of the sea near Falmouth,  
Hudson. ?

Perennial.

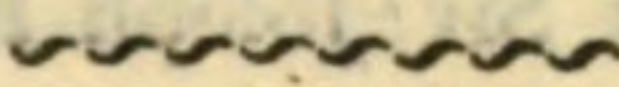


Root unknown ; stem filiform, rigid, rough with the remains of broken shoots, cylindrical, above a foot long, much and irregularly branched : branches again repeatedly divided in a sub-dichotomous manner, producing scattered leaves, not thickly set, nor punctate, as in *F. natans*, varying in form from lanceolate to linear, and sometimes extending to three inches in length, while their breadth does not equal a single line : they are pervaded by a black midrib, and their margins always ferrato-



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dentate, with minute, spine-like teeth : in general, from the alæ of the leaves, but often from other parts of the branches, and copiously from the stem, are produced globular, hollow vesicles, supported on short, cylindrical stalks, and almost always tipped with a subulate point, of uncertain length : in size, they seldom exceed that of pepper-corns. No fruit has hitherto, to my knowledge, been found upon this species. Its habit is extremely curled ; the substance of all the parts very rigid and fragile, that of the bladders tough and strong : their colour is a reddish brown, quite opaque.



In the specific characters of the present and preceding Fucus, I have carefully endeavoured to avoid every thing which might tend to mislead unexperienced botanists, by contrasting, as well as I was able, those points in which I believe a real difference to exist, and but slightly noticing those which I consider rather to be attributed to the effect of casual circumstances. Among the former, I would wish to be reckoned the different ramification, the general substance of the frond, the greater or smaller proportion of vesicles, and the form of the peduncles : to the latter, I refer



the shape of the leaves, which, I am well aware, is subject to much variation, but which will, nevertheless, in some measure, help to discriminate these plants; as, though their breadth and length are in both uncertain, still, in *F. natans*, the former bears a greater proportion to the latter, than in *F. bacciferus*; the ends are more rounded, and the serratures less narrow or spinous. In the Linnæan Herbarium both are preserved, together with a third, which may be still different, having very minute serratures, and obovate leaves: they are all indiscriminately named *F. natans*. The same, if I remember rightly, is the case in the rich collection of Sir Joseph Banks, so liberally open to the inspection of all men of letters. Gmelin, also, who evidently possessed many varying specimens, considered all as the same; and, though I am fully sensible it may appear rash and presumptuous in me to differ from such distinguished authorities, still, I trust, it will also be considered that I have, on that account, weighed the matter with more care, and not formed my opinion upon a hasty or a cursory examination: that opinion, such as it is, I now give; and shall, with the utmost readiness, retract it, as soon as I see cause for so doing; till which time, I hold it upon the following grounds.—The ramification



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of *F. natans* is strikingly dissimilar to that of *F. bacciferus*, not being irregularly divided in a repeatedly sub-dichotomous manner, but rising, as far as I have seen, with an unbranched stem, pinnated on each side with short, sub-alternate, simple shoots, themselves, also, pinnated with numerous leaves, from the alæ of which, copiously grows the fructification, whereof, I believe, no appearance has ever been found in *F. bacciferus*. The bladders of this, on the other hand, are extremely numerous, always globular, or rather depressed at their summits; their colour black, and their coats very tough; they are supported on short, hard, cylindrical footstalks: in *F. natans*, the vesicles are thinly scattered, often much elongated at their apices, so as to be rather oblong than spherical; their colour light-brown; their coats almost membranous; their footstalks flat and dilated towards the summits. The substance of the stem and branches of *F. natans* is pliant and smooth; that of the leaves very thin, punctured with perforations as in *F. ferratus*. In *F. bacciferus* the stem is tough, rigid, unyielding, and every where rugged with the remains of broken shoots: the leaves almost coriaceous, without any symptom of perforations. These are the differences upon which Mr. Wigg and I have formed our judge-



ment; to estimate them properly, the plants must be examined in water, as many of them are far less striking in dry specimens. I do not pretend to think that the botanist who undertakes the examination of all Linnæus comprized under *F. natans*, will be satisfied with what I have done under so confined a view; but, though he may find much to correct and amend, I flatter myself he will do me the justice to allow, that what is here written is the result of actual observation; and I hope that, in the main points, he will agree with me.

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### 13.—FUCUS SILIQUOSUS.

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*F. fronde compressâ ramosâ; foliis distichis alternis integerrimis; vesiculis pedunculatis oblongis cavis; filiquis lanceolatis solidis.*—Herb. Linn.—Buddle, p. 15. n. 1.—Uvedale, p. 1. n. 2. and p. 5. n. 1. 2.—Buddle and Vernon, without fructification, p. 22. n. 3.—Gmelin, p. 81. t. 2. B.—Esp. p. 27. t. 8.—Fl. Dan. t. 106.—Ner. Brit. p. 8. t. 5.—E. B. t. 474.



—Aët. Paris. 1772, partie 2de pl. 4. f. 22.  
 l. m. n. o. p. q. in fructification—the root,  
 f. 20. 21.—Michelis' Marine Plants, t. 22.—  
 Linn. Sp. Pl. p. 1629.—Linn. Transf. iii.  
 p. 124.—Fl. Ang. p. 574.—Fl. Scot. p. 921.  
 Fl. Fr. i. p. 96.—Fl. Suec. p. 431.—Fl. Lapp.  
 p. 365.—Fl. Norv. i. p. 83.—With. iv.  
 p. 88.

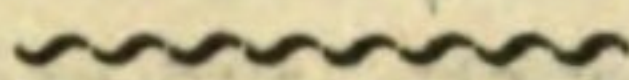
*Fucus angustifolius*, vesiculis longis filiquarum  
 æmulis.—R. Syn. p. 48. n. 38.—Moris. Hist.  
 Ox. p. 647. n. 7.

$\beta$ . minor; fronde vix dodrantali.

*Fucus filiculofus*.—Ner. Brit. p. 42. t. 11.

$\alpha$  is common upon the shores of England, Wales,  
 and Scotland:  $\beta$  was found by Mr. Stackhouse  
 near Fowey, in Cornwall.

Perennial—November—March.



Root an expanded disk; in perfect plants  
 always cone-shaped, common to three or four co-  
 riaceous fronds, from one to four feet long, very  
 smooth, first rising in the form of simple, flat, li-  
 near, midribbed leaves, entire at their margins, and  
 about two lines wide: at the height of an inch or  
 less, these become pinnated with others similar to  
 themselves, in an alternate, distichous series, and

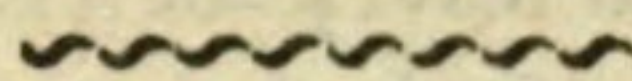


perforated with minute punctures. As the plant advances in age, the primary leaves thicken into compressed, solid stems and branches, beset on each side with alternate, pedunculate, oblong vesicles, of various length, on the same specimen from half an inch to three inches, transversely furrowed without, and hollow within, except that they are divided into compartments by from four to twenty septa, answering to the external furrows, each about two lines distant from the other, of a pulpy and transparent nature, but apparently not composed of the nerve of the leaves, as has been suggested; since that still remains, and runs, longitudinally, through them, in the form of a few thin, parallel, colourless, rarely anastomosing, fibres: the vesicles are generally terminated by a mucronated point, thin and solid, with no appearance either of joints or midrib; sometimes extending to an inch or more in length, and occasionally, though rarely, containing the seeds; the proper place for which is in shortly-pedunculated filiquæ, whereof two or three are found at the end of almost every branch, of an oblongo-lanceolate form, compressed, and full of a parenchymous matter, among which the seeds lie in round or oval clusters, about thirty in each, situated in a circle round a minute perforation, whence they escape



when they become ripe, before which time, it is closed, and appears only a dark spot. The colour is an olive-green, soon changing to black: substance coriaceous, and very tough, but flexible: branches are very seldom, if ever, found so perfect as not to have lost some of their vesicles; the peduncles of which remaining, give the plant a thorny appearance.

$\beta$  differs in the smaller size of all its parts, and in its frond being not more than nine inches long.



The list of references subjoined to the specific character of this *Fucus* sufficiently demonstrates that scarcely any species is more generally found upon those shores of the world which have been explored by the votaries of botany; fortunately, too, scarcely any is more readily distinguished, and scarcely any subject to less variation of appearance. Mr. Stackhouse's *F. filiculofus*, which alone I have considered deserving notice as a distinct variety, is remarkable for its dwarfish size, its bushy habit, and the comparative smallness of all its parts; except which, I can see no trace of difference, for the roots, leaves, and mode of fructification agree with *F. siliquosus*; and, though



it seems to have escaped the observation of the author of the *Nereis*, I find, upon dissecting the vesicles of a specimen given me by himself, that they are hollow within, and divided into compartments in a similar manner to those of that species. It is these which separate the present plant so clearly from every other, and which are evidently designed to serve the purpose of air-bladders, for keeping the frond in a state of buoyancy, though, for a long time, they were considered the seat of the fructification; and botanists, comparing them to the pods of beans, expected, from analogy, to find the seeds within them. Many, even of the most accurate, were deceived by this conjecture; but, of the few that were not so, the indefatigable Micheli deserves particular mention; as it is but little known that, in a very scarce collection of admirable plates of marine plants and zoophytes, published by him, there is a figure of the present species, with its fructification completely delineated. It was long after the publication of *F. siliquosus* in *E. B.*, that Mr. Stackhouse and myself, by mere accident, met with this work in Sir Joseph Banks' library, where, I believe, the only copy known to be in England is preserved; except one in the possession of Dr. Smith, which, through his friendship, is



now before me. There is no letter-press; not even the name of each accompanies the figures, to which I have, nevertheless, sometimes referred, as they are so excellent, that if any botanist would undertake the re-publication of them, he would do a real service to science. I am, however, wandering from my subject, upon which I have only to add, that I have a specimen of this plant given me by Mr. Bryer, of Weymouth, so singular, that it is sufficient to puzzle even an experienced observer; and, if often found so, deserves particular notice: it is, apparently, the side-shoot of a larger plant, but extends above a foot in length, composed of a very narrow, compressed stem, and long, thin, flat leaves, but little divided, without any appearance of their any where swelling into vesicles, or pods; scarcely half a line broad, and of almost the same breadth throughout all its parts. It is, I presume, to a somewhat similar appearance, that Messrs. Goodenough and Woodward refer in their observation, that "they have seen large plants of this Fucus thrown up without any approaches to fructification."—*F. filiculosus* Linn. of which, there are specimens in his Herbarium, is nearly related to this Fucus, but perfectly distinct, and unlike any other I ever saw.

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14.—FUCUS ABROTANIFOLIUS.\*

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F. fronde filiformi compressâ bipinnatâ; ramulis extremis vesiculosis, vesiculis innatis ellipticis terminatis foliolis multipartitis tuberculatis.—Herb. Linn.—Linn. Sp. Pl. 1629.—Fl. Ang. p. 575.—Ner. Brit. p. 86. t. 14.

In the English sea, Leofling.—On the coasts of Suffex and Hampshire, Hudson.

Perennial.

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The only specimens of this Fucus that I have had an opportunity of examining, have been destitute of any root, and composed solely of a straight, undivided stem, little more than a foot long, and hardly two lines wide, compressed, linear, and pinnated throughout with simple, distichous, irregularly-placed branches, similar in substance and appearance, excepting their smaller size, to the stems; and, like that, again pinnated with fetaceous shoots, which are an inch or more in length, and twice or thrice divided in a sub-



dichotomous manner, the angles of the divisions being somewhat rounded; each of these bears one, and sometimes two, elliptical vesicles, about the size of the seeds of *Abrus precatorius*, producing from their ends, and often also from their sides, or bases short peduncles, either once or twice branching, with almost divaricated shoots; or, as is more frequently the case, simple, except at the ends, which are cleft into a few very short segments, covered with minute tubercles, wherein the seeds are contained: their form, when the plant is not in fructification, is linear and obtuse; but at the time of its bearing fruit, they are narrowly ovate, and slightly lengthened. The bottom of the stem is provided with linear leaves, pinnated, or rather pinnatifid, like the branches, but entire at the margins, destitute of vesicles or tubercles, and every where flat, even to the extremities. The substance is coriaceous; colour, when dry, a dark reddish brown, which remains unchanged if the plant be again immersed in water.

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The whole British catalogue of Fuci hardly furnishes the example of a species involved in greater doubt and obscurity than the present; for, besides that it belongs to a division full of pecu-

liar difficulties; and one, whereof those individuals which are best understood, are understood but imperfectly, it has always laboured under still greater disadvantages from the small number of the authors by whom it has been mentioned, and the very few specimens of it that are known to exist. To this is to be added that, even among those writers who have treated of it, Linnæus himself, by whom it was first described, added to the confusion, by referring in his 2d Mantissa, (p. 508.) to *F. capensis* of Gmelin, (p. 157. t. 17. f. 1.) as a synonym; and adding, that it approached nearly to *F. cartilagineus*; a strange mistake, into which that great man never could have fallen, had he fully understood the plant of which he was speaking; but, unfortunately, the only specimen of it, contained in his own Herbarium, is a miserable fragment, destitute both of the lower leaves, and the finer parts of the upper branches; one, upon which little dependence ought to be placed; and which, when Mr. Wigg and I lately examined the collection, appeared to us, on account of its large, confluent vesicles, as by no means agreeing so exactly as might be wished with those from which the present description, as well as that in the Linnæan Transactions, and Nereis Britannica, was taken. Thus situated, I have held it as the

safest path to follow two authors of such high repute as those just mentioned; especially as what they have described appears the same as that which is preserved in the remains of Hudson's Hortus Siccus; and, besides agreeing well with his and the Linnæan character, is, unquestionably, very distinct from all its congeners. That among them, to which it is most nearly allied, is the *F. fœniculaceus*, from which it differs by the bladders being much larger, and not concatenated, as well as by the terminating tuberculiferous segments being divided; in this latter case, it agrees with *F. difcors*, and *F. compressus* of Esper, (t. 77.); but may be immediately distinguished from both these by the presence of air-bladders, and by the leaves, which among these plants vary strikingly in form, and are highly useful in the discrimination of the several species; though, from their being sometimes deciduous, and always, I believe, swelling into branches, they are not unfrequently wholly wanting, and have not had so much attention paid to them as they deserve. The soft, thorn-like processes too, which are quite distinct from the leaves, and which I have called spines, merit particular attention, as indeed does every other circumstance that will tend to assist in the separating species so intimately connected in habit, &c.

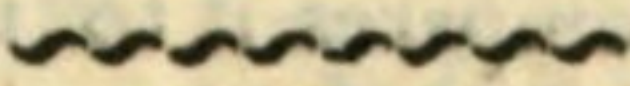
The present *Fucus* is quite unprovided with these. Professor Esper, misled by the error before-mentioned of Linnæus, has quoted it as a synonym of *F. cartilagineus*; but has given no figure of it, even as a variety. *F. abrotanoides* of Morison and Gmelin, so near in name, is the British *F. fibrosus*. The specimen from which the present description is made, is one among a few that were brought by a sailor for Mr. Wigg, many years ago, from the Mediterranean.

15.—FUCUS DISCORS.

F. fronde tereti ramosâ; foliis lineari-lanceolatis ferratis alternatim pinnatifidis, summis capillaribus, apicibus multifidis ovatis tuberculatis.
 —Herb. Linn.—Syst. Nat. p. 717.—Esp. p. 59. t. 26.—Ner. Brit. p. 108. t. 17.—Fl. Norv. ii. p. 46.—Micheli's Marine Plants, t. 23. f. 1.

Root a small, expanded disk, whence arises an undivided, cylindrical stem, six or seven inches long, about the thickness of a goose's quill, more

or less rough with short, leaf-like, irregular appendages, and decreasing in size as it increases in height: at the summit it is divided into a few erect shoots, which, in their earliest stage, bear the form of linear-lanceolate leaves, sharply serrated at the margins, pervaded throughout with a dark midrib, and punctate like those of *F. natans*; these are alternately pinnated with others, similar to themselves, but more narrow, and so again divided, till they become almost capillary, and terminate in acute segments, the extremities whereof, at the time of fructification, bear three or four ovate, pointed pods, generally simple, but occasionally binate or bifid; hardly a line long, and supported on peduncles of about the same length: their surface is covered with minute tubercles, which contain the seeds, and sometimes, immediately below them, the stem is slightly dilated into a small, lanceolate vesicle, so narrow, as to be scarcely visible. I have seen no other appearance of vesicles, nor any symptoms of spines upon this species, the colour whereof is a reddish brown, nearly diaphanous in young plants, and not so dark as in most others of the same division: the substance of the stem is between ligneous and coriaceous, that of the leaves cartilaginous.



This *Fucus* again, unfortunately, provides us with another instance of the indispensable necessity of descriptions being made only from perfect plants, and of the specimens preserved in authentic Herbaria, being so complete as to leave no doubt of the species to which they belong. From want of sufficient attention to the latter of these circumstances, the Linnæan Herbarium here also is the source of confusion only, rather than elucidation; the sole piece of this *Fucus*, which it contains, being scarcely more than an inch and half long, and so imperfect, that little reliance is to be placed upon it. Micheli's figure is excellent; and on the same plate he has drawn another, which differs from this only in not being in fruit, and being regularly provided with vesicles, so that it probably is not specifically distinct. I ought here to mention a peculiarity attending *F. discors*, which is, that the tuberculated pods are sometimes found on the ends of the broad and flat, as well as of the capillary and almost cylindrical leaves; a circumstance that might easily mislead a botanist not well acquainted with this tribe of plants. The roughness of the stem, which Linnæus calls "*inermis aculeatissima*," is little to be depended upon; for, though sometimes so striking, that Professor Esper compares it to thick felt; in the

English specimens it is almost entirely wanting. The serratures of the leaves, their distichous, alternate mode of branching, and their linear-lanceolate form, are the most striking characteristics of the present species. The botany of England is indebted to Mr. Stackhouse, not only for being the first who published, but the first also who found *F. discors*, which he gathered at Sidmouth, in the year 1797. Professor Esper's specimen came from the coasts of Italy, where I suspect it is not uncommon.

16.—FUCUS MUCRONATUS.

F. fronde tereti ramosissimâ; ramis filiformibus spinosis, extremis vesiculosis; vesiculis innatis lanceolatis moniliformibus, terminatis mucrone simplici tuberculato.—Petiver, p. 34. n. 4, 5, 6.—Buddle, p. 15. n. 2, 3. and p. 39. n. 3.
—Reaumur, Act. Gall. 1712. t. 3. f. 5.

Fucus fœniculaceus.—Linn. Transf. iii. p. 134.
(excl. Syn. Linn.)

..... *concatenatus.*—Fl. Ang. p. 574.—Fl. Scot.

p. 923.—With. iv. p. 89.—Vellay, t. 2. f. 1.
—Esper, t. 87.

Fucus nodicaulis.—With. iv. p. 111.

..... *pinnatifidus*.—Esper, p. 146. t. 99.

At Weymouth and Falmouth.

Perennial—January.

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Root a solid disk, so small as to be scarcely dilated: frond generally about a foot in length, branching, in young plants, immediately from the root, but in older ones, rising for three or four inches with an undivided, or only forked stem, about the thickness of a swan's quill; cylindrical, so tough as to be almost ligneous; closely beset with hard, ovate, bulb-like knobs, half an inch or more in length, which terminate in single branches. The first beginning of ramification in this species consists of flat, linear, midribbed leaves, not more than half a line wide, and quite entire at the margins; sometimes simple, but in general irregularly pinnatifid with rounded angles into several segments, which, lengthening, become cylindrical, filiform branches, either divided and subdivided in a dichotomous manner; or, which is more rare, preserving throughout a main stem, sub-alternately pinnated with similar, but smaller



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ramuli; beset, at uncertain distances, with subulate, almost horizontal, scattered spines, hardly a line long, and most numerous in the terminating shoots: these are often simple, or but slightly branched, and are formed of a series of lanceolate, or oblong vesicles, two, three, or more on each, and generally confluent; though sometimes separated by the distance of nearly half an inch from each other. The extreme ones, when barren, end in short, multifid leaves, with blunt terminations; but, when in fruit, are lengthened into a point near an inch long, which is so thickly covered with small, round, feminiferous tubercles, as to be of a subulate shape, and give the bladders a mucronated appearance: in general it is simple, but sometimes forked; sometimes two of them grow together; not unfrequently also similar ones issue from the sides of the vesicles. Such is the most common appearance of this Fucus: but some specimens which Mr. Sowerby and I gathered at Falmouth, in June, 1799, were so different, that I was long persuaded they must be a distinct species; and, even now, the impression is too strong in my mind for me to be fully persuaded of the contrary. They are quite destitute of vesicles, and composed entirely of the linear leaves, which are flat throughout, except that at



the terminations they take a cylindrical form, and are covered, for the length of half an inch or more, with numerous, round tubercles, placed very close to each other, as in *F. granulatus*, and producing among them a few scattered spines. The substance of this plant is coriaceous: its colour a dark, dull red, which turns black when it is dry.

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Under the name of *F. fœniculaceus* are preserved in the Linnæan Herbarium three specimens, one of which is the plant here described, but in so young a state, that it can hardly be recognized: the other two are a very different species, and answer so much better to the description in the *Systema Naturæ*, that there is scarcely room for a doubt of their being what Linnæus really intended; and consequently, with the concurrence of Dr. Smith, I have, however reluctantly, for the third time changed the name of the *Fucus* before me. The reluctance that I feel on this occasion is greatly increased by a forcible conviction that neither this, nor any of the present tribe is so well understood as might be wished; and that no British Herbarium, at least none which it has been in my power to consult, contains a

sufficient series of specimens to enable any one to judge with the precision necessary to the determination of so difficult a question. Most of them are natives of the Mediterranean and Adriatic, whence our opportunities of procuring them are always small; and, from the lately perturbed state of Europe, have been for some time totally destroyed. From the testimony of various authors, it appears that they are equally common in those seas, as *F. vesiculosus* is in that which washes our coasts; and, therefore, it is more than possible that our sentiments, which are formed upon single specimens, or at most only a very few of each, will at last prove to be erroneous. These observations suggested themselves to my mind in consequence of the various figures, under the name of *F. concatenatus*, in Professor Esper's work, and some plants from him now before me, which are, unfortunately, but fragments; so that it would be wrong to ground any positive opinion upon them: but at the same time are so strangely subversive of all I before thought most certain, that I am fully prepared hereafter to adopt a new set of sentiments upon this division of Fuci. At present, however, I only speak of what I have seen; and, therefore, as I shall not be obliged to introduce either *F. foeniculaceus*, or *concatenatus*, I may

hope to steer clear of any very gross errors; the plant here described being a native of the southern coast of England, where it is far from uncommon, so that I have had opportunities of examining it, through the kindness of my friends, in all its varied appearances. Its concatenated vesicles, ending in long tuberculated points, sufficiently distinguish it from all those among the British species, with which there could be any fear of its being confounded. Its narrow, linear, and entire leaves are almost equally characteristic; on which accounts, were it not for the possibility of this work falling into the hands of some botanist who directs his attention also to the foreign Fuci, I should hardly consider it necessary to say more upon the subject. As that is the case, I must add, that *F. mucronatus* appears to me to differ from *F. fœniculaceus*, chiefly in its branches being provided with spines; in their being placed irregularly, instead of being pinnated in an alternate manner; and, still more strikingly, in the extreme vesicles terminating in a sessile, pod-like point, near an inch long, instead of producing several small peduncles, each slightly swelling at its summit into a minute filiqua, the length whereof does not equal a line. I trust that these characters are certain; if not, I am sorry to say I know no

better : general habit, though widely dissimilar in the specimens I have seen, being of too vague a nature to allow any specific distinction to be formed upon it. With *F. concatenatus* Linn. which it ought to be mentioned that both Hudson and Lightfoot quoted with marks of doubt, it agrees in the spines upon the branches, and the manner in which these latter terminate; but differs in the smaller size of all its parts, in the fructification being less granulated, and in the leaves being linear instead of lanceolate. My specimens would not justify me in dwelling upon the shoots of *F. concatenatus* being all opposite; and I, therefore, lay no stress upon that circumstance. The synonyms of *F. mucronatus* are so much perplexed, that I have ventured upon quoting none which did not appear to me quite certain. *F. concatenatus* of Wulfen, in Jacquin's *Collectanea*, i. p. 354, was probably intended to include this species, of which I have a drawing from his own Herbarium, by the kindness of Professor Mertens, named "*F. concatenatus* in advanced age." Gmelin's description of his *F. abies marina* appears to me in the same predicament: it is well known that his T. 2. A. f. 1. which, in the list of plates, is erroneously referred to under that name, represents a very different

species. Ginanni's figure, t. 15. which the Baron von Wulfen quotes with the flattering addition of "optimè," is, unluckily, destitute of fruit; and strikes me, for the same reasons that were alledged by Gmelin, to differ from *F. concatenatus*, and to have been most probably intended for *F. fœniculaceus* Linn. The error into which Dr. Withering fell, in describing an old, battered stem of *F. mucronatus* as a new species, under the name of *F. nodicaulis*, is far from wonderful; and might have been the lot of a botanist who had enjoyed better opportunities of investigating these plants in their places of growth. Dr. Esper's having mistaken it for *F. pinastroides*, is rather more surprizing. Under all these difficulties, who will deny that wisdom lies in doubt?

17.—FUCUS BARBATUS.

F. fronde tereti inermi ramosissimâ; ramis filiformibus, apice tuberculiferis; tuberculis in filiquam ovatam cuspidatam congestis.—Linn.
Transf. iii. p. 128.

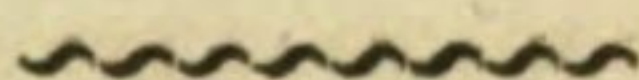
F. fœniculaceus.—Gmelin, p. 86. F. 2 A. f. 2.
—Esper, p. 67. t. 30.—Fl. Ang. p. 575.—
With. iv. p. 87.—Ner. Brit. p. 83. t. 14.—
Wulfen in Jacq. Coll. i. p. 360.—Roth. Cat.
Bot. ii. p. 158.—Micheli's Marine Plants,
t. 26. f. 1.

℞. tuberculis laxiùs dispositis, contiguis.

F. granulatus.—Linn. Transf. iii. p. 131. (exclusis
synonymis.)

Devonshire, Hudson.

Perennial.



Root orbicular and solid, producing a cylindrical stem, about the thickness of a goose's quill, five or six inches high, beset with tuberos knobs, from which issue numerous, filiform branches, repeatedly dichotomous, not larger than small pack-thread at their insertion, and gradually diminishing in size to their summits; where, when barren, they are almost capillary, and generally forked; but, in a state of fructification, they are swelled into ovate pods, formed of a congeries of minute tubercles, hardly a line long, and ending in a very minute, sharp, setiform point; this is occasionally extended to a sufficient length to produce a second pod, like the former; and sometimes, though

rarely, one or two tubercles are scattered upon the branches, somewhat below the extremities, giving it the appearance of *F. granulatus*, as is strikingly the case in the variety β . I have never seen either leaves, vesicles, or spines on this species; the substance of which, like that of its congeners, is between coriaceous and ligneous; the colour a dark, reddish brown, quite black after it is dry.

β differs in the tubercles being less crowded together; and in some branches disposed at short distances from each other, like the beads of a necklace.

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From the excellent description of this *Fucus*, given by the Baron von Wulfen in the place above quoted, I have borrowed my account of its root and stem, neither of which is to be found in any of the specimens that I have hitherto been fortunate enough to receive. Gmelin appears to have been the earliest writer who clearly understood this species; and the figure he has given of it in his t. 2 A. f. 2., not f. 3. which is erroneously quoted, but does not exist, is so characteristic, that there can be little fear of its being mistaken by any botanist who has once seen that plate. To the authors of "*Observations upon the British Fuci*"



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we are obliged for being the first, who, by a careful investigation of the Linnæan Herbarium, clearly pointed out its differences from the *F. fœniculaceus*, with which Hudson, as well as most other writers on the subject, had previously confounded it. These differences have been, in some degree, remarked under the preceding species; but it may not be amiss here to mention them, more particularly in reference to the present *Fucus*, by briefly stating, that the extreme branches of *F. fœniculaceus* Linn. are provided with concatenated vesicles; and that from the terminating one issue several short peduncles; two circumstances fully adequate to separate it from *F. barbatus*, of which the shoots are all equally destitute of vesicles, and terminate each in a single ovate filiqua. From Linnæus' description of *F. granulatus*, Gmelin was induced to conjecture, that there was not a sufficient specific distinction between that species and the present; a conjecture, which a reference to the Linnæan Herbarium proves to be unfounded; as the three specimens there preserved under that name are thickly provided with spines, and one of them also with a moniliform series of small vesicles, so that their difference from *F. concatenatus* may, with more propriety, admit of a doubt. Indeed I suspect, and I wish



the suspicion may be unfounded, that, when the time comes which furnishes us with a satisfactory account of these plants, it will be found that, as every thing in the form of a *Conferva*, which, floating on the surface of ditches, is sufficiently matted to form air-bubbles, is called *Conferva bullosa*; so every *Fucus* of this division, of which the tubercles are at all granulated at the extremities, bears in its turn the name of *F. granulatus*. That figured by Professor Esper, t. 61. is certainly different from the Linnæan one; that represented in the *Flor. Dan.* t. 591. appears equally so; and yet both of them are not less distinct from each other, and both look as if they were good species. From what I have seen of the specimens collected in England, from which the description, made by my friends in the Linnæan Transactions was drawn up, I must own that these seem to me to be only varying appearances of *F. barbatus*; in which supposition, Mr. Stackhouse and Mr. Wigg, with whom I conjointly examined them, fully coincide; so that, backed by two such respectable authorities, I have little hesitation to describe them as such; and, believing the real *F. granulatus* not to be a native of England, I have altogether omitted it; not, however, without a hope that, if the kindness of my friends should hereafter



enable me to procure it from the coasts of Italy, I may, at some future time, describe it in another place, under better auspices.

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### 18.—FUCUS SELAGINOIDES.

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*F. fronde tereti ramosissimâ; ramis paniculatis spinosis; spinis alternis subulatis basi tuberculiferis sub-tetrastichis, superioribus densè imbricatis.*—Micheli's Marine Plants, t. 27. f. 1.?  
—Linn. Transf. iii. p. 132. (excl. syn. Gmel.)  
—Wulfen in Jacq. Coll. i. p. 356.—Syst. Nat. p. 717.

Among the rejectamenta of the sea at Weymouth, and the Isle of Portland.—Linn. Transf.

Perennial.

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Root an expanded disk, of considerable size; fronds numerous, about eight inches long, at first rising with short, thick stems, every where beset with knob-like excrescences, whence issues, according to Wulfen's expression, "a whole wood



of branches," cylindrical, filiform, four or five inches in length; again clothed with others, especially near the summits, arranged in such a manner as to resemble a panicle. The lower part of the primary branches is naked, or only rugged with the remains of broken shoots; but towards their ends they are furnished with small, sessile, subulate, simple spines, about a line long, slightly compressed at the base, but cylindrical and acuminate at the extremity; distant from each other, and growing in a patent direction, and irregularly tetrastrichous order. The extreme branches are thickly clothed with these, which are there densely imbricated: at their bases they bear minute, solitary, globular tubercles, in which are contained the seeds. The colour of this Fucus, when fresh, is a dark, sub-diaphanous red, which dries to black: its substance is between ligneous and coriaceous; flexible in moist, but rigid and fragile in dry specimens. I have never heard of any leaves or vesicles being found on this species.

I have little to say upon this species, except that what I have here described appears clearly to be the plant intended by Linnæus in the 12th edition of his *Systema Naturæ*, above quoted; at



least that it seemed so to Dr. Smith and myself, when, in company with that able botanist, I had the pleasure of investigating our great master's Herbarium; where, under this name, are preserved five specimens, one whereof struck us as his *F. granulatus*; two as Hudson's *F. tamariscifolius*; and the remaining two as that which is here inserted. A great part of my description has been borrowed from the excellent one given by de Wulfen, whose botanical acumen and knowledge are too well known for any encomia from me to add to his reputation; and whose opportunities of examining these plants in their places of growth give such weight to his opinions, that they may almost be considered as decisive. It was he who first separated this species from Gmelin's T. 2 A. f. 1. of which, no name or description is to be found in his work; a division that fully coincides with my sentiments; as, though I have never seen the Baron's *F. corniculatus*, I have a specimen from Teneriffe that coincides with the figure; and is, at least in appearance, sufficiently distinct from *F. selaginoides*; which latter approaches more nearly to Gmelin's *F. erica marina*, t. 11. f. 2. and scarcely differs, except that the spines are patent instead of adpressed, from some plants of that species, which



I lately received from a military friend, stationed at the island of Minorca. How far *F. selaginoides* can be properly kept distinct from the following, *F. tamariscifolius*, is a question that, I must own, appears to me very doubtful, though at present I follow the opinion of Dr. Goodenough and Mr. Woodward, in opposition to that of Mr. Stackhouse, whose sentiments are decidedly in favor of uniting them. I must also add, that I follow it because it seems to me that it is supported by the majority of preceding authors; and because neither my own Herbarium, nor experience, allows me to entertain any thing that can properly be called a positive opinion of my own.

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### 19.—FUCUS TAMARISCIFOLIUS.

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*F. fronde tereti ramosissimâ; ramis filiformibus spinosis, extremis vesiculosis; vesiculis subrotundis innatis, terminatis spinis subulatis basi tuberculiferis.*—Buddle, p. 18. n. 2. and p. 19. n. 2, 5.—Petiver, p. 40. n. 3. (fine).  
—Ner. Brit. p. 44. t. 11.—Fl. Ang. p. 576.  
—With. iv. p. 86.



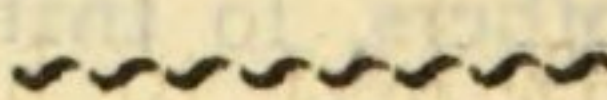
*Fucus ericoides*.—Linn. *Transf.* iii. p. 130.  
..... *myrica*.—Gmelin, p. 88. t. 3. f. 1.  
..... *felaginoides*.—Esper, p. 69. t. 31.  
..... *foliis Ericæ, seu Tamarisci*.—R. Syn. p. 49.  
n. 44.

On the rocks near Falmouth, and St. Michael's  
Mount, Cornwall.

Perennial,

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Root a solid, expanded, large disk, in age approaching to a conical form, rising with a stem equal in thickness to a swan's quill, and about six inches long, irregularly beset, especially towards the upper part of it, with hard, oblong knobs, from the ends whereof grow the branches, and extend above a foot in length: in their earliest stage they appear in the form of numerous, flat, clustered, ensiform leaves, about an inch long, and a line wide, destitute of a midrib, and generally rather oblique, quite entire at their margins; the lowest undivided, the rest pinnatifid with segments, similar to them in shape, substance, and every other respect; these, by degrees, become cylindrical, and soon lose all vestiges of their former state; in which case they do not seem to be replaced with others, so that in a full-grown

plant they are rarely to be detected, and consequently have escaped the observation of most authors. The branches are filiform, again and again producing others in a sub-paniculated, or irregularly pinnated manner, so numerous as to give the plant a shrubby appearance; all of them beset with subulate, cylindrical spines, somewhat compressed at their insertion, but acuminate at the tips, rather distant from each other, each three lines or more long, shooting from the stem at a roundish angle, but pointing upwards; generally binate, and growing in alternate pairs, but sometimes single, and disposed without regularity. The extreme shoots in perfect plants swell into one or two small, roundish, or ovate vesicles, scarcely so large as pepper-corns, the sides of which are also frequently provided with a spine, or occasionally two; beyond these, the shoot continues for the length of a few lines, producing numerous imbricated spines, generally tufted like the top of a pine-apple, each bearing, near its base, a very minute, pale-pink tubercle, full of seeds. The colour of this Fucus is a reddish brown, more diaphanous and pleasing than that of its congeners; its substance is between coriaceous and cartilaginous, except the stem, which is rather ligneous.



I have retained Hudson's original name to this *Fucus*, from a belief, expressed under the preceding species, that Gmelin's *F. erica marina* is in reality a distinct plant, more nearly related to the *F. selaginoides* Linn., and not a native of the British coasts. On this account I have rejected that synonym, and felt no hesitation in replacing it by a reference to his *F. myrica*, which indeed agrees well with old, battered specimens of this *Fucus*, and could never have been overlooked, had he not represented the bladders as pedunculated; an error that he fell into from want of having seen it in a perfect state; hence also some other inaccuracies in his description, but of a nature too trifling to need enumeration. Colonel Velley first remarked that this species, in a growing state, might be easily recognized by the bright glaucous tints reflected from it: and Mr. Sowerby and myself, in June 1799, found this observation hold good in all the plants of it we met with. The tints were so striking, that the whole *Fucus* appeared of a pale-green colour, very little removed from white; nor, till we had taken it out of the water, were we at all aware of what we had got, so complete was the deception. We saw nothing similar in *F. mucronatus*, or *fibrosus*; nor do I recollect ever to have remarked an

appearance of such a nature in any other of the marine algæ; the bright prismatic hues reflected from *F. crispus*, and noticed under that species, being very unlike in their effect, as well as most probably in their origin. Should this work be fortunate enough to fall into the hands of any botanist, who has it in his power to examine *F. barbatus*, *granulatus*, *selaginoides*, &c. on their native rocks, I wish he may remember this circumstance, and enable us, by his observations, to judge how far it applies to the others, or may serve to form a characteristic of *F. tamariscifolius*. Before I dismiss this tribe of plants, I must say a few words upon the subject of their mode of fructifying, which I have had an opportunity of examining more accurately in the present species than in any of its congeners. In this circumstance they differ strikingly from all the rest, except *F. rotundus* and *Norvegicus*, (with which they have little else in common) in their fruit, when mature, not being covered with the epidermis of the frond; but, if I may use the expression, exuding from it, and lying in the form of a minute globule, not so large as a small pin's head, on the outside of the spines: its colour, in this state, is a pale pink, quite opaque; its shape, if examined by a microscope, irregular, and granulated like a

wart; its substance very different from that of the rest of the plant. Previous to maturity, it wears the appearance of a black tubercle; but whether it is then under the epidermis, and afterwards escapes through any puncture, or whether the subsequent change is formed by the coat of the spines undergoing an alteration in their substance, is a circumstance that I have hitherto had no opportunity of examining; nor, in so minute an object, would it be easy to prosecute the enquiry with the necessary accuracy. I can, therefore, only refer those who are desirous of farther information to *F. rotundus*, under which species this subject is again treated. I have quoted Professor Esper's figure of *F. selaginoides*, rather on the authority of what is said by Mr. Stackhouse, than my own opinion. Perhaps, Micheli's figure, introduced under the preceding *Fucus*, might also, with more propriety, be brought to the present.

20.—FUCUS FIBROSUS.

F. fronde tereti inermi ramosissimâ; vesiculis subrotundis moniliformibus innatis; foliis inte-

gerrimis, inferioribus lineari-lanceolatis, superioribus fetaceis.—Buddle, p. 18. n. 4.—Petiver, p. 40. n. 5.—Fl. Ang. p. 575.—Linn. Transf. iii. p. 137.—With. iv. p. 87.—Ner. Brit. p. 80. t. 14.

Fucus abrotanoides.—Gmelin, p. 89.—Esper, p. 65. t. 29, and 29, A.

..... *baccatus*.—Gmelin, p. 90. t. 3. f. 2.—Esper, p. 108. t. 54.—Schmidel, p. 78. t. 1.

..... *abrotanoides* vesiculis parvis rotundis ornatus.—Moris. Hist. Ox. p. 648. f. 15. t. 8. f. 17.

..... *radicibus arborum fibrosis similis*.—R. Syn. p. 49. n. 45.

β . foliis omnibus fetaceis.

F. fetaceus.—Fl. Ang. p. 575.

γ . foliis omnibus lineari-lanceolatis.

α and β grow at Falmouth and Ilfracombe, and not unfrequently at other places in the south-west of England; γ was gathered at Guernsey.

Perennial.—December—March.

The root of this *Fucus*, like that of all its congeners, is a small, expanded base, whence arises a frond, which often extends to above three feet in height; composed, in perfect plants, of an

undivided stem, about seven inches long, and about the size of a goose's quill, not beset, in any of the specimens I have seen, with hard, tuberos knobs, but producing, in a distichous, alternate series, the primary branches, which are thickest at their insertion, and gradually taper to the extremities: these are in the same manner furnished with others of similar form, which also in their turns become again and again divided: towards their bases they bear numerous linear-lanceolate, midribbed leaves, an inch or more long, and scarcely a line wide, very entire at their margins, and destitute of any tendency to become branched; some of them are also scattered over the central and upper parts of the shoots; but, in general, the leaves, with which those parts are thickly clothed, are quite setaceous, unprovided with a midrib, running from a quarter of an inch to two inches in length, and frequently twice or thrice dichotomous. The extreme branches, at intervals, swell into elliptical or roundish vesicles, almost as big as the seeds of *Vicia sativa*, hollow within, often three or four on a single shoot, sometimes nearly confluent, and sometimes with considerable spaces between them. At the period of fructification, the terminating parts of the branches, which always extend considerably beyond the

vesicles, are generally stripped of their leaves, and thickly covered with close, granulated tubercles, neither so much crowded together as in *F. mucronatus* and *barbatus*, nor so large and moniliform as in *F. granulatus*, but arranged at slight distances from each other, and dispersed equally over the whole extremities, in such a manner as hardly to alter their appearance, except by increasing their size. The setaceous leaves of this species are frequently broken, so as to give it the semblance of bearing spines; but I believe the plant to be in reality quite unprovided with any. The substance of the stem and primary branches approaches to ligneous, that of the rest of the frond is coriaceous; the colour is a sub-diaphanous, yellowish olive when fresh, but turns black after the plant is dry, and never by subsequent immersion recovers its natural hue.

The leaves of β are all setaceous; those of γ , even to the extremities, linear-lanceolate.

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After so many difficult and doubtful species, it is matter of no small consolation to meet in the same division with one, which, as well from the abundance in which it occurs on the western coasts of England, as from the peculiarity of its



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leaves, may be considered not only perfectly distinct, but well understood in all its varying appearances. Attending even this, however, there is much to puzzle a botanist not accustomed to the investigation of these vegetables; for its being sometimes found wholly covered with the setaceous leaves, and sometimes on the other hand, but I suspect very rarely, altogether destitute of them, is a circumstance which, unless particularly pointed out, would be very apt to mislead the unexperienced. It appears that, in this *Fucus*, nature has deviated from the plan she seems to have preserved in all the rest of its congeners, that are of British growth; for the linear-lanceolate leaves, which in the others are but the rudiments of branches, here, as far as my observations go, continue always undivided; and, instead of constituting the first shoots of the plant, are only to be found in perfect, and full-grown specimens. Mr. Sowerby and I gathered at Falmouth what struck us as the seedlings of this species, though, without having our opinions confirmed, we could not venture positively to pronounce them such: they were scarcely an inch high, of a pale-red colour, and full of setaceous shoots, so thickly set, as to be almost imbricated; from their size, they were of course unprovided with vesicles; but I



conceive it to have been these which, in a state somewhat more advanced, misled Mr. Hudson, and induced him to form a new species, under the name of *F. setaceus*. Should I be right in this conjecture, that can have no longer any claim to remain as a variety; till, however, this idea is confirmed or refuted, I follow the steps of my predecessors. The shape of the bladders in *F. fibrosus* is very uncertain; sometimes being almost globular, and again nearly lanceolate; in which latter form they are figured by Schmidel, who found this plant near Dieppe, in Normandy, and from whose Herbarium, through the kindness of the learned President von Schreber, I have a specimen gathered by himself, so that there can be no doubt of the species he intended; though his having described the stem covered by a coralline has caused it to be suspected. Both his figure and Gmelin's are characteristic of the plant in a battered state, and useful as representing it in its most disguised appearance. Morison has erred in having drawn the root also fibrous. Mr. Stackhouse seems to consider that the setaceous leaves are only the larger ones with their edges rolled in; but surely their want of a midrib proves them to be of a different nature. He remarks, that in some cases this *Fucus* may be mistaken for *F. foeniculaceus*,



of Linn. Transf. Gmelin, in his second note on *F. baccatus*, furnishes us with a very just and pleasing account of the steps that nature appears to have followed in her transitions among the present species and its congeners. It is a singular coincidence that he should describe it as a very rare plant, only once gathered by Pallas, near the Hague; and that at Yarmouth, which is almost opposite, it should never have been found, except during the winter of 1798, and then only very sparingly.

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## 21.—FUCUS LIGULATUS.

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*F. fronde planâ aveniâ sub-cartilagineâ bipinnato-ligulatâ; ligulis oppositis distichis, extremis lineari-lanceolatis spinoso-dentatis.*—Linn. Transf. iii. p. 123.—Fl. Scot. p. 946, t. 29.  
—With. iv. p. 101.

*Fucus herbaceus.*—Fl. Ang. p. 582.

*β. fronde angustiore triplicato-pinnatâ; ligulis extremis ferè integris.*

Annual.

Among the rejectamenta of the sea near Hastings,



Hudson—in the Frith of Forth, Lightfoot—and at Yarmouth, but rarely.



Root a small, almost black, flat, expanded, knob-like base, from the middle of which arises a straight stem, in general solitary; cylindrical at its origin, but, at the distance of an inch or less, becoming compressed, and soon quite flat: in height it often extends to six feet; in width it seldom, if ever, surpasses three lines, and is linear, except that it tapers towards the extremity, and ends in an acute point. This, throughout its whole length, is pinnated with opposite, undivided, patent, and distichous branches, beginning at a short distance from the root, and placed a few lines from each other; the lowest in general longest, but by no means constantly so, though the upper ones are always shortest; in form, substance, and every other respect, except their smaller size, they resemble the stem, and are again pinnated in a similar manner with extreme ramuli, or leaves, of a lineari-lanceolate form, the margins of which are minutely dentate, or ciliate with spine-like ligulae, which, in all probability, were the existence of the plant sufficiently protracted to allow it, would in time lengthen into new shoots. I do not, how-



ever, recollect ever to have seen a specimen more than bipinnate, except of the variety  $\beta$ , which is singular on other accounts. The fructification, I believe, remains still to be discovered. *F. ligulatus* is of a substance between cartilaginous and membranaceous, uniform throughout, except that the lower part of the stem, being more thick, partakes more of the former quality: its colour, when fresh, is a pale brown, slightly tinged with orange, but so fugitive, that it changes, after it has been gathered only a few minutes, to a light verdigris-green, and afterwards to a dirty white. In a recent state it is endued with considerable elasticity, which also it soon loses, and becomes so flaccid, that scarcely any species is more difficult and troublesome to expand.

In  $\beta$ , the frond is tripinnate, the stem and branches are more narrow, the ramuli so faintly dentate, that the incisions are scarcely visible.



The place to which this elegant Alga is properly entitled in the system must, till the fructification is discovered, be considered as a matter of some uncertainty; yet, at the same time, both from its general habit, and from the example of preceding authors, I have felt no hesitation in



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retaining it among the Fuci ; which, in losing it, would lose one of their brightest ornaments, as, for delicacy of shape, as well as symmetry of parts, it stands unrivalled, and deserves a place among those of the first division, whose greater beauty only depends upon the more striking brilliancy of their colour. A circumstance, which adds particularly to the effect of this species, and is wholly wanting to them is, that in vigorous specimens the serratures of the leaves often exhibit an appearance of terminating in short, woolly fibres, somewhat resembling those of *F. pedunculatus*, and giving an exquisite delicacy to the whole plant. Upon the nature of these fibres, and the purposes which they are intended to answer in the œconomy of these vegetables, some hints will be found in the preface ; it is sufficient here to observe, that they are by no means always present, and consequently not necessary appendages. The form of the outline of a perfect specimen is somewhat uncertain, being sometimes ovate, and at others, perhaps more frequently, ensiform ; it is rarely that any are found sufficiently small to be compressed within the compass of a common-sized Herbarium, and often they are so large and bushy as to lie in considerable masses upon the shore. Mr. Hudson has marked its duration as perennial,



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but I must own there appears to me little or no doubt of its being only annual; as, though I never saw it in its place of growth, still in those years when it is found in Yarmouth, it is regular in the period of its appearance; being confined almost exclusively to the months of June, July, and August, in the course of which its growth may be traced; and afterwards, if any remains of it be seen, it is almost always a mere fragment, which serves but to indicate that its time is over, and that, like every thing else, "it has had its day." In the habit, substance, and particularly the colour of this Fucus, a considerable similarity may be traced to that of *F. viridis*, with which alone of the British list it seems to have any near connection in these respects; and though the difference between them is too remarkable to need being pointed out farther than by the specific characters, and in every artificial arrangement it must be necessary to keep them widely apart, still, if seen only lying on the beach, or floating in water together, in a case where the general effect can alone be distinguished, it would require a keen eye to discriminate them at first sight. In the mode of its ramification it resembles none so much as some of the larger varieties of *F. corneus*, which are found in the Mediterranean, and from



which, in a work where they were included, a more particular account of the differences between these two species would be requisite. *F. ligulatus* belongs to the more rare Fuci, and has hitherto, I believe, never been seen growing on its native rocks, though occasionally found among the rejectamenta of the sea in various parts of our island. It seems to have escaped the notice of all foreign, as well as of all the older writers.

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## 22.—FUCUS ESCULENTUS.

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*F. fronde simplici indivisâ ensiformi stipitatâ; stipite pinnato; pinnis distichis oblongis aveniis.*—Herb. Linn.—Syst. Nat. p. 718.—Linn. Mant. p. 135.—Fl. Dan. t. 417.—Fl. Scot. p. 938. t. 28.—Fl. Ang. p. 578.—Fl. Lapp. p. 364.—With. iv. p. 93.

*Fucus fimbriatus.*—Gmelin, p. 200. t. 29. f. 1.

..... *tetragonus.*—Linn. Transf. iii. p. 140.

..... *pinnatus.*—Fl. Norv. i. p. 96.

..... *Scoticus latissimus edulis dulcis.*—R. Syn. p. 46. n. 30.



β. minor; fronde basi attenuatâ.

*Fucus teres*.—Linn. Transf. iii. p. 140.

Perennial.

α is found at King's Cove, and St. Michael's Mount, Cornwall,—in Scotland, Lightfoot,—and in the Isle of Man, Rev. H. Davies,—β in the Isle of Anglesey, Rev. H. Daves.

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Root composed of numerous, radiated, rigid fibres, scarcely branched; from the center of which arises a solitary frond, that extends often to above ten feet in length, composed of a cylindrical, undivided stem, about the thickness of a small goose-quill, winged, at the distance of from three to seven inches from the root, with a flat, simple, undulated, ensiform leaf, the base whereof varies in form from cordate, through all the intermediate gradations, to lanceolate. Its width is generally about four inches, but sometimes, according to Lightfoot, not less than a foot; it is nearly linear throughout, except that it tapers towards the extremity, which, even in young plants, is seldom found perfect, and ends somewhat acutely. The stem, about midway between the root and leaf, is pinnated with simple, ribless, oblong, sometimes almost cuneiform foliaceous

ligulæ, rounded at their apices, and very uncertain both as to size and number. In general, a plant produces about eight pair, but sometimes on a single individual may be counted more than fifty, which in length differ from half an inch to near seven inches: they are all so much attenuated at their insertion as to appear almost pedunculated, and are there of a thick cartilaginous substance; in which respect they continue to diminish, in proportion as their width increases, till at their ends, which are frequently above an inch wide, they are quite membranaceous. They are arranged in a distichous order, at small distances from each other. The plant does not acquire these till it has attained a considerable size. Below them the stem is quite cylindrical, but above them it begins immediately to be slightly compressed, and continues growing more and more so, till it is winged, when it soon becomes flat, and in full-grown plants perfectly square. Even to the extremity it preserves its substance, and, gaining in width, in proportion as it loses in cylindricity, is occasionally found, according to the Flora Scotica, half an inch wide: its usual thickness is about a line. The leaf is often spotted with tufts of short fibres, as in *F. ferratus*. The fructification is unknown. The substance of the stem is cartilaginous, that of the

leaves thin, and almost membranaceous. The colour of the whole a sub-diaphanous olive green.

β is a dwarf variety, not above two feet long, or two inches and a half wide, with the base of the leaf so much attenuated, as to be decurrent.

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In this species I have once more found myself under the necessity of differing from the arrangement of Dr. Goodenough and Mr. Woodward, although supported by such authority as that of Rev. Hugh Davies, to whose zeal and success in the investigation of these plants this work bears repeated testimonies; and I here again repeat, that, though I adopt the opinion which my own remarks and Herbarium seem to confirm, still I adopt it with that diffidence, which a real love of truth and earnestness for the promotion of science necessarily inculcate. For the present I have retained *F. tetragonus* and *teres* of the Linnæan Transactions as distinct varieties, but I must own, that I doubt whether the observations of future botanists will allow even of this separation; for the base of the frond is certainly liable to great variations in shape; the squareness of the midrib appears, by my specimens, also to depend upon the age of the individual, as well as the distance



from the root at which the nerve is examined ; and the thickness of the pinnæ I have often found far more considerable in  $\beta$  than in  $\alpha$ , which is in direct opposition to what others have remarked. It is nevertheless singular that Mr. Davies, near whom the plant is abundant, should have seen it only in the smaller state, and should have found the base of the leaf constant in its attenuated form. Mr. Sowerby and myself, in our journey through Cornwall, were fortunate enough to meet with this rare Fucus in great plenty, growing on the rocks at the places above-mentioned, and to gather specimens of all sizes, from less than two inches to more than ten feet in length. One of them, that had already reached about four feet, was still unprovided with the pinnæ on the stem, and had scarcely begun to exhibit the rudiments of them. In their youngest stage the leaves are formed of a delicately thin, pale-green, pellucid membrane, so unable to bear any injury, that even the smallest we found were imperfect ; as they advance in size they become slightly rigid, or rather elastic, and approach nearly to cartilaginous, but are always very thin. The manner in which they are waved is singular, since, instead of the undulations being, as in *F. saccharinus* and most others, confined to the margin, they run



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horizontally from the midrib to the edges, and are almost equally conspicuous near the former as the latter. There is no British species with which *F. esculentus* can possibly be confounded, nor any to which it is very nearly related; its closest affinity appears to be *F. saccharinus*, but its differences from this *Fucus*, are too striking and numerous to need farther mention, than what is afforded by the specific characters. The fructification, when discovered, will most probably be found in the pinnæ, which seem intended to answer no other purpose; their form, substance, and want of a midrib precluding the idea of their being designed for a proliferous mode of increase. In Gmelin's figure of this *Fucus*, it is represented as fixed to a rock without any apparent root, his specimens being destitute of that organ; but in his description he justly concludes from analogy, that it must be provided with a fibrous one. In the north of England, according to Lightfoot, it is the food both of men and cattle; whence its name. Its proper season is in the month of September, at which time it is in its greatest perfection. The membranous part is rejected, and the stalk only is eaten. The same author farther observes that, it is recommended in the disorder called a pica, to strengthen the sto-



mach and restore an appetite. Respecting Ray's synonym, above quoted, I have followed the opinion of Hudson, rather than that of the Flora Scotica, where it is referred to *F. edulis*, not because the description itself furnishes any thing characteristic, but because Ray has quoted Bauhin's "*F. alatus*, five phasganoides," which unquestionably belongs to the present *Fucus*.

### 23.—FUCUS SERRATUS.

*F. fronde lineari dichotomâ ferrato-dentatâ; apicibus bifidis planis, sterilibus obtusis, tuberculiferis acutis.*—Herb. Linn.—Buddle, p. 8.  
—Petiver, p. 28. n. 1.—Uvedale, vol. 1. p. 2. n. 2. and p. 3.—Act. Paris. 1711, pl. 9, 10; et 1712 partie 2nde, pl. 3. f. 1, 2, 3, 4, 5, 7, and 9.—Ner. Brit. p. 1. t. 1.—Esp. p. 23. t. 5 and 6.—Sp. Pl. 1626.—Linn. Transf. iii. p. 143.—Fl. Ang. p. 576.—Fl. Scot. p. 902. With. iv. p. 91.—Vellay, t. 1. a, b, c.—Baster vi. p. 120. t. 11. f. 3.—Gmelin, p. 57.—Fl. Suec. p. 430.—Fl. Lapp. p. 365.—Fl.



Fr. i. p. 95.—Fl. Norv. p. 28.—Roth, Fl. Germ. iii. p. 441.

Fucus, five alga latifolia major dentata.—Moris. Hist. Ox. iii. p. 648. f. 15. t. 9. f. 1.—

R. Syn. p. 42. n. 7.

$\beta$ . ramis superioribus dilatatis ovato-lanceolatis.

Quercus marina humilis, latifoliae ferratae similis.

—R. Syn. p. 42. n. 8,

$\gamma$ . ramorum marginibus integris.

$\delta$ . fronde, praesertim ad apices, vesiculoso-inflatâ.

$\alpha$  is common on all the shores of Britain;  $\beta$  and

$\delta$  were found at Yarmouth;  $\gamma$  in Cornwall,

Mr. Stackhouse.

Perennial.—December—April.

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Root spongy, solid, and dilated, but provided with a few thick fibres; frond in general solitary, rising in height from two to six feet, or more; consisting of a compressed but prominent stipes, thicker and stronger than the leaf-like branches with which it is on both sides winged, naked towards the base, except in very young plants; in old ones, often extending so to a considerable length, and, from the constant attrition of the waves, sometimes sub-cylindrical. In barren shoots it reaches to the very extremities, though gradually

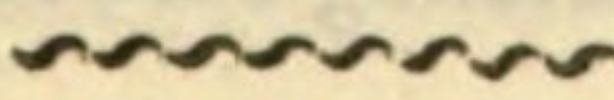
becoming less thick and visible: in seminiferous ones it ends where the fructification begins. The frond is flat, generally little more than half an inch wide, dichotomous at irregular distances, and with acute angles; the margins serrated, or rather serrato-dentate, with divisions more or less pointing towards the summits, and varying much also in their depth; most frequently slightly incurved, and sometimes compound: the extremities of the branches are almost always bifid, but the length of their segments is uncertain; when barren, they are oblong and rounded at the ends; when in fruit, they taper to a point, and might almost be called subulate; they are flat even in that state, by which the plant may immediately and most surely be distinguished from *F. vesiculosus*; each side of the midrib is irregularly dotted with minute, somewhat prominent dark spots, with a perforation in their center, whence clusters of short, colourless filaments, so small as to be invisible, except from their number, generally issue. The fruit consists of numerous tubercles, placed in a gelatinous mass at the extremities of the frond, sometimes reaching above two inches down it, with roundish, dark-brown seeds, according to Colonel Velley's remark, neither so opaque, nor so numerous as in *F. vesiculosus*, placed opposite

to perforations in the surface, through which, when mature, they escape. Substance tough, between coriaceous and cartilaginous; colour of the leaf an olive brown, tinged with yellow in the fructifying summits; that of the nerve darker; sometimes the leaf is a light green, and the midrib still more pale; in both cases the plant turns black when dry.

In β , the fronds, instead of preserving an equal breadth from base to summit, are very much dilated towards the extremities, the form of which is thence almost ovate.

γ differs in having the margins quite entire, and is a curiously intermediate plant between this and the following species.

I never either saw or heard of more than one specimen of the variety δ , which on that account I should hardly have mentioned, but for its extreme singularity. Mr. Wigg found it on the beach at Yarmouth, in the summer of 1801; the frond is throughout swollen at intervals, in a manner exactly similar to Linnæus' *F. inflatus*, and the summits, which are in fruit, bear a precise resemblance to those of *F. vesiculosus*, except that the tubercles extend much farther down the frond: this is one of those lusus which Nature seems to indulge in to bid defiance to the systematic observer of her works.

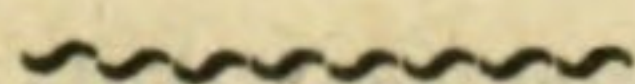


Although in *F. ferratus* the breadth of the frond is highly uncertain, and towards the summits of β extends almost to an inch and half, there can be no difficulty in distinguishing it in every stage of its growth from the following, with which alone there is any chance of its being confounded, as well by the ferrated edges of the branches, as by the total want of the globular vesicles, whence that species derives its most prominent character and name. Equally striking and characteristic in the present *Fucus* are the ends of the fructifying shoots, which produce seeds for a considerable length, without in any wise assuming the form of pods, or differing in shape from the sterile ones, except that instead of being rounded, and often only emarginate, their terminations are acute, lengthened, and almost mucronated. To these circumstances it is to be added, that they never grow turgid with the mucus they contain, a character whereon the greatest dependence is to be placed, and which I cannot conceive that the single specimen, on which the variety δ is formed, ought by any means to be considered as invalidating; for it must be observed that the fronds of this and the following *Fucus*, together with those of several others, are formed of two distinct coats, enclosing between them the paren-

chymous matter, in which the capillary fibres are imbedded; so that, either by the puncture of an insect, or any other accident, air may be admitted between them, and inflation is the necessary consequence. Any botanist may convince himself of the truth of this assertion, by putting a branch of this species into a slow fire, when, before it becomes quite dry, he will, from the unnatural distention produced by the heat, frequently see it swell into irregular tumors. The learned authors of "Observations on the British Fuci" have remarked the singularity of the root, which, in the specimens that have fallen under my observation, has been by no means so curious as they mention; since, though I have found it of a soft and spongy nature, and not regularly formed like those of *F. filiquosus* and *vesiculosus*, I have not been fortunate enough to see it "with nerves or fibres standing out above the surface of the callus," so that this must be considered as a somewhat uncertain mark. It is sufficiently known that *F. serratus* is the plant upon which Reaumur founded his visionary theory of the fructification of the submerged Algæ, a subject already noticed in my preface, as well as by almost every other author, who, since his time, has preceded me. Baister observes that this plant is preferred by the Dutch

fishermen for packing up their lobsters, to *F. vesiculofus*, from which so much more mucus exudes, that it is apt to rot and corrupt them. At Cromer, in Norfolk, it is used for the same purpose; and some failors there, whom Mr. Wigg and I once saw busily engaged in separating those fish from each other with it, when asked why they employed so much trouble on the matter, replied, "that it was not only to keep them moist, but to hinder them from fighting, which they would be apt to do without such a preventative." Gmelin informs us that, if burnt, it yields a much smaller quantity of lixivial salts than the following, as six ounces only can be produced from sixteen ounces of ashes. There is no doubt about the synonyms of this species; and the descriptions I have given of the three varying appearances above distinguished, will, I trust, be sufficient to separate them: γ alone, for which I am indebted to Mr. Stackhouse, appears a link that draws *serratus* more close to *vesiculofus*; yet even this is sufficiently marked, and the length for which the seeds extend down the branches, leave no doubt of the species to which it really belongs.

24.—FUCUS VESICULOSUS.



F. fronde lineari dichotomâ integerrimâ; vesiculis globosis innatis axillaribusque; apicibus bifidis, sterilibus planis, tuberculiferis tumidis.—Herb. Linn.—Buddle, p. 4. n. 1, 2. p. 6. n. 4. p. 7. n. 1, 2, 3.—Petiver, p. 32.—Uvedale, p. 1. n. 1. p. 4 (divaricated). p. 5. n. 3.—Act. Paris. 1772, partie 2de, pl. 3. f. 6, 10, 11, 12, 13.—Micheli's Marine Plants, t. 21, and t. 31. (in its earliest stages of growth).—Sp. Pl. p. 1626.—Linn. Transf. iii. p. 144.—Fl. Ang. p. 576.—Fl. Scot. p. 904.—Ner. Brit. p. 3. t. 2. and p. 12. t. 6.—Esper, p. 35. t. 12, 13. and p. 160. t. 83, 84.—Volley, t. 1.—With. iv. p. 84.—Baster, vi. p. 116. t. 11. f. 2.—Fl. Fr. i. p. 95.—Fl. Carn. ii. p. 403.—Fl. Norv. i. p. 48.—Roth, Fl. Germ. iii. p. 442. Fl. Succ. p. 430.—Fl. Lapp. p. 366.

Fucus divaricatus.—Sp. Pl. p. 1627.—Fl. Scot. p. 909.—Fl. Norv. ii. p. 143.—Esper, p. 31. t. 11.

..... quercus marina.—Gmelin, p. 60.

..... five Alga marina latifolia vulgatissima.—

R. Syn. p. 40. n. 4.

Fucus marinus vulgatissimus latifolius foliis quercinis, vesiculis donatus.—Moris. Hist. Ox. iii. p. 647. n. 1.

..... bullatus fruticescens caule nudo foliis rectis compressis bifidis.—Moris. Hist. Ox. iii. p. 647. f. 15. t. 8. f. 5.

Quercus marina herbacea et varietas.—Parkinson, p. 1293. t. 11.

Virfoide.—Donati, p. 33. t. 3.*

β . inflatus—fronde apicem versùs vesiculoso-inflatâ.—Herb. Linn.—Buddle, p. 5. n. 2.

Fucus vesiculosus. γ .—Linn. Transf. iii. p. 144.

..... inflatus.—Sp. Pl. p. 1627.—Fl. Scot. p. 910.—Fl. Suec. p. 431.—Fl. Lapp. p. 367.—Fl. Norv. ii. p. 38.—Esper, p. 30. t. 10.

..... *Quercus marina*. ι .—Gmelin, p. 63.

..... palmaris platyphyllus bidigitatus in vesiculas longas ventricosas conjunctas se terminans.—Moris. Hist. Ox. iii. p. 647. n. 11.

* This reference possibly belongs rather to *F. spiralis* Linn. the fifth variety of *F. vesiculosus* in this work, though, from the shape of the terminating pods, I preferred placing it in its present situation. It is, however, a matter of very little consequence.

- γ. acutus—fronde apicibus tuberculiferis productis
lineari-lanceolatis.—Buddle, p. 4. n. 3.
- Fucus vesiculosus. δ.—Linn. Transf. iii. p. 144.
- spiralis.—Esper, p. 36. t. 14. and p. 143. t. 72.
- δ. foliaceus—ramis proliferis, ramulis oblongis undulatis confertis.—Buddle, p. 5. n. 4.
- Fucus vesiculosus. ε.—Linn. Transf. iii. p. 144.
- undulatus.—Ner. Brit. p. 103. t. 16.
- ε. spiralis—fronde spirali, apicibus tuberculiferis obtusis.—Herb. Linn.—Buddle, p. 6. n. 1, 2.
—Micheli's Marine Plants, t. 19. (in various forms).—Baster, vi. p. 118. t. 11. f. 1.
- Fucus spiralis.—Sp. Pl. p. 1627.—Fl. Dan. t. 286.
—With. iv. p. 92.—Ner. Brit. p. 10. t. 5.—
Fl. Ang. p. 577.—Fl. Scot. p. 911.—Fl. Suec. p. 431.—Fl. Lapp. p. 366.—Fl. Norv. ii. p. 64.
- Fucus quercus marina. ε.—Gmelin, p. 62.
- vesiculosus.—Wulfen in Jacq. Coll. iv. p. 343. ?
- spiralis maritimus major.—R. Syn. p. 41. n. 5.
- palmaris latioribus foliis in binas ternasve vesiculas verrucosas terminatis.—Morif. Hist. Ox. iii. p. 647. f. 15. t. 8. f. 10.
- Quercia marina che ha vesiche.—Ginanni, p. 21. t. 20. f. 39, 40.

ζ. volubilis—fronde spirali vix palmari, apicibus productis.—Buddle, p. 7. n. 4, 5.—Linn. Transf. iii. p. 144.

Fucus volubilis.—Fl. Ang. p. 577.

..... spiralis maritimus minor.—R. Syn. p. 42. n. 6.

η. linearis—fronde planâ angustâ spithamæâ, apicibus tuberculiferis lineari-lanceolatis.

Fucus linearis. Fl. Ang. p. 578.—* Fl. Dan. t. 351.—Fl. Norv. ii. p. 104.

..... distichus.—Fl. Scot. p. 912. (excl. fyn. Linn.)—With. iv. p. 93.

..... filiformis.—Gmelin, p. 72. t. 1 A. f. 1. ?

..... vesiculofus. η.—Gmelin, p. 62.

..... fove quercus marina minima angustifolia.—Moris. Hist. Ox. iii. p. 647. n. 4.

θ. angustifolius—fronde angustissimâ bipedali, apicibus tuberculiferis sub-pedunculatis lanceolatis acuminatis.

Fucus angustifolius.—With. iv. p. 92.

* This reference is somewhat doubtful, from the frond being figured without a midrib; but, considering that only as an error of the engraver, I have little hesitation in quoting it here.

Fucus quercus marina. δ .—Gmelin, p. 62.

..... seu *quercus marina* angustiore folio raro
vesiculas habens.—Moris. Hist. Ox. p. 647.
n. 3.

.. *Sherardi*—foliis brevioribus ad apicem congestis; fructificatione in summis foliorum formâ immutatis.

Fucus Sherardi.—Ner. Brit. p. 72. t. 13.

α , β , γ , and δ are common upon all parts of the British shores; ϵ , η , ϑ , and ι are found in Cornwall, Mr. Stackhouse; ζ grows at Wells, in Norfolk.

Perennial.—January—December.

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Root a small, expanded disk, whence arises a frond from one to four feet, or even more high; naked, cylindrical, and as large as a swan's quill at its base, but gradually becoming compressed, and at a greater or less distance, according to the age and size of the specimen, winged on each side, so as to form branches, from half an inch to an inch wide; linear throughout, very entire at the margin; repeatedly divided every where in a dichotomous manner; studded with small, dark, mucifluous perforations, as in *F. ferratus*, at irregular distances; and flat, except where they are



swollen into globular hollow vesicles, generally placed in opposite pairs along the frond, and singly at the divisions of the branches, but occasionally scattered in a very uncertain manner, and not unfrequently wholly wanting. The interior part of these vesicles is lined with a closely-matted series of minute, capillary, colourless fibres, jointed and anastomosing, like many species of *Conferva*; their size varies from that of a common pea, to that of hazel-nuts. The angles formed at the dichotomies are extremely different in the same plant; sometimes being quite acute, at others rounded, and again frequently so obtuse, that the shoots almost make a straight horizontal line. The terminations of the branches are almost always bifid, the segments of most uncertain sizes and shapes; but, generally speaking, those which are barren are short and rounded at the ends, while the fructifying ones are elongated and ovato-lanceolate. In these, an individual specimen not unfrequently produces instances of strange variations, and they may easily be traced from globular, through roundish, obcordate, oblong, and ovate, to completely lanceolate. Sometimes too they are single, and supported on long shoots, as if pedunculate; at others, they are immersed in the tips of the plant, without its apparently under-



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going any change of shape on their account; they are entire and bifid; solitary and binate without any fixed order, and occasionally, though rarely, they grow on single short branches from the side of the frond, as represented by Mr. Stackhouse: their length is not less uncertain, being variable from three lines, to two inches. In all cases they are much swollen, and their insides filled with a clear, transparent mucus, full of capillary filaments, and singular for being perfectly destitute of any salt taste. Within this, immediately under the outer surface, and placed near perforations in it, lie globular clusters of roundish, dark-coloured seeds, seemingly enclosed in a capsule of a different substance from the surrounding mucus. This plant is coriaceous and tough, but some of its various appearances approach rather to cartilaginous; and I have a specimen gathered at Yarmouth, which, from alternate exposure on the sand to the power of the sun and waves, is become quite membranaceous, and has changed its natural olive, or dull green hue, for a very pale, reddish brown. When dried it turns to black.

$\beta$  is distinguished solely by the leafy part of the extreme branches on either side of the midrib being inflated into oblong, hollow tumors, of various size and length, in which occasionally the midrib



also is included, and the whole consequently swollen into a cylindrical form. These swellings are most frequent at a short distance from the summits, but seldom, if ever, entirely reach them, so that, when dried, the branches wear a sub-ovate appearance; wherever they are observable, the coats of the frond are very thin, and generally of a pale, yellowish colour, whence it is easily seen they have no connection with the air-bladders natural to the plant. It is almost needless to remark that they are most probably the effect of some injury, whereby air is introduced between the two coats of the frond, as they are equally common in all the varying forms of this species: they are most general in the beginning of spring.

γ is remarkable for the long and sharp terminations of its fructifying shoots, which approach more nearly than any other to those of *F. ferratus*, the shape of the frond experiencing little or no alteration on their account, except in the acuteness of the apices: the pods are compressed rather than cylindrical. Messrs. Goodenough and Woodward mention that they are sometimes bluntish, but I have never seen them so. This variety is no less conspicuous for its flat, glossy, even surface, and the equal size of its shoots, which preserve throughout the breadth of about a quarter of an



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inch. It runs to a very great length, perhaps exceeding in that respect every other appearance of this species: the upper part of it is seldom provided with vesicles. Professor Esper has mistaken this for *F. spiralis*, and, especially in his t. 72, has given an excellent figure of it.

§ I should hardly have considered it necessary to have separated as a distinct variety, or indeed to have noticed at all, except as a proof of the wonderfully prolific power with which nature has gifted this species, had not the example been set me in the third volume of the Linnæan Transactions, and my friend, Mr. Stackhouse, gone still farther, by raising it into a new species. From what I have seen of it however, it appears to be only a plant of *F. vesiculosus*, which, either from the fury of the waves, or some other circumstance, has been stripped of its lateral, foliaceous membrane, and has consequently thrown out from the midrib a profusion of new leaves, the form whereof, as must be the case in the earliest shoots, is oblong. I take this opportunity of observing that, wherever the frond of this species is injured, a copious supply of fresh shoots, as in the fabulous Hydra of antiquity, arises from the nerve to repair the loss, and that the same is the case with the pods. Ginanni's



“*Quercia marina florida*,” of which he remarks, that the leaves at the top form a bouquet, depends merely upon this circumstance.

$\epsilon$  is in almost every respect the reverse of  $\gamma$ , its general habit being quite dissimilar, and short and bushy, instead of long and diffuse. The spiral mode of growth, whence it derives its name, is by no means either constant or to be relied upon, and is common also to several other varieties of this *Fucus*: its most striking mark depends upon its humble mode of growth, its almost total privation of vesicles, and its short, nearly globular fructifying summits, the two latter of which characters, were they but constant, would be fully sufficient to establish it as a distinct species. I have however specimens from Rev. H. Davies, which agree in the shape of the tips and other respects, but are as full of vesicles as any of the most common appearances of *F. vesiculosus*; and in the Linnæan Herbarium is preserved, under the name of *F. spiralis*, a piece which, though a mere fragment, exhibits an instance of oblong, purse-shaped, and short rounded apices issuing from the same stem. I have therefore preferred following the example, set me by the accurate and indefatigable Roth, of considering it merely as a variety, though I readily allow it to be a most



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singular one. Micheli's figures of this are excellent; and, as well from Ginanni's having represented, as from the Baron de Wulfen's having described no other, I cannot but suspect that this alone is found in the Adriatic sea. I have never seen a specimen that extended to a foot in length, as mentioned by Ray, nor have I any idea of the lower part of the frond being channelled, according to what Linnæus says in the *Systema Naturæ*. It is possible such might be the case in a dried specimen, the danger of describing from which is much greater than can be easily imagined. Lightfoot observes, that "the edges, though naturally entire, are often torn and jagged by the rocks and waves even to the middle rib; appearing as if cut into lanceolate segments:" a remark that also extends to the other varieties of *F. vesiculosus*.

Respecting the variety  $\zeta$ , Ray has expressed a doubt how far it may not possibly prove a distinct species; and Hudson seems to have had no hesitation in making it so: I cannot therefore but lament, that, neither by myself or my friends, I have yet had an opportunity of satisfying my own mind upon the subject. In July 1797, I found, I believe I may say, more than an acre of ground at Wells, in Norfolk, covered with specimens of it, all of which were about four inches



high, three lines wide, quite destitute of vesicles, and far more strikingly spiral than any others I ever saw: besides which, the midrib was less visible. Since that time, I have never had it in my power to revisit the spot; and, as it was not then in fruit, I reserve my opinion till I find it so. It is possible that its dwarfish mode of growth may arise from its situation in a place where it is not always under the water. In the oblong, sub-acuminated termination of its barren branches, as well as its general habit, it differs much from the preceding variety. Linnæus' *F. volubilis* is a widely dissimilar species, excellently figured in Jacquin's *Collectanea*, and Esper's *Icones*.

For the knowledge that the variety *n* of this work is the same as Mr. Hudson described under the name of *F. linearis*, I am entirely indebted to my obliging correspondent, Rev. H. Davies, who was kind enough to divide with me an original specimen, given him by the author of the *Flora Anglica*. There appears to me little doubt of its being also what Lightfoot intended for *F. distichus*, as well from the size he attributes to it, as from his references. The true Linnæan plant of that name is very distinct; has its ends similar to those of *F. lumbricalis*, but strongly tubercled, and its midrib so faint as to be hardly visible. Gmelin's



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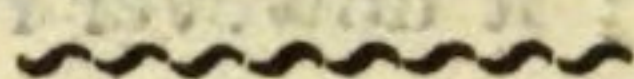
figure, above referred to, is somewhat doubtful. The leading characteristics of this variety are the small breadth of the leaves, which hardly equals two lines; its height, that does not exceed five or six inches, and its long, linear-lanceolate, sharp pods occupying nearly a sixth part of the whole.

♀, except in size, differs but little from the preceding variety; it however runs to the length of two feet or more, preserving throughout a narrow, linear frond; its pods grow singly, on long shoots resembling peduncles, and are rather of a lanceolate form, but remarkably acuminate, so as to be almost mucronate at their apices; sometimes, too, they are bifid. This appearance also of *F. vesiculosus* is generally, if not always, destitute of vesicles. Dr. Withering, upon the authority of Mr. Stackhouse, first described it as a new species in the 3d edition of his *Botanical Arrangements*; but it appears not to have escaped the notice of Morison, as above quoted.

I admit entirely in consequence of its having been introduced in the 3d fasc. of the *Ner. Brit.* as a distinct species; and, from the negligence of the engraver, not having seen the plate wherein the figure of it is contained, I can do little more than copy Mr. Stackhouse's words on the subject. It has shortish leaves, crowded at top, the summits



of which bear the fructification, without swelling into distinct fruit-vessels. Excepting its smaller size, I can find no difference in some specimens of it that he has been so good as to send me, and the preceding variety  $\delta$ ; so that possibly, like that, it may be suspected to owe its origin to a casual injury.



I have now described what appear to me the leading varieties of this comprehensive species; and, if I should chance to have a reader sufficiently patient, or complaisant, to wade through all I have written on the subject, in answer to the charge, that I am sure he will urge against me, of prolixity and dullness, I will reply beforehand, that it has been far more tedious to me to write, than it can possibly be to him to read. To satisfy those who will not trouble themselves so far; but who, seeing the number of pages occupied exclusively about a single Fucus, may be equally ready to alledge the same accusation, I will farther hint, that it was necessary to be particular in the descriptions of the several varieties, since most other authors, as they may satisfy themselves by consulting the list of references, have considered them distinct species; so that this account ought to be



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looked upon not so much as peculiar to one, but common to many. To attempt to go farther, and enumerate every singular appearance exhibited by this marine Proteus, which, in point of changes, yields only to *F. crispus*, would be really an almost endless, and in my opinion also an useless, task; the plant itself being so common on all the shores of Britain, that there is hardly a botanist, however unexperienced, who has attended at all to this tribe of Algæ, but is able to distinguish it in the forms wherein it generally presents itself. It cannot be denied that its globular air-vessels, innate in the leafy part of the frond, furnish by far its most striking character; and yet I am much mistaken, if a too rigid attention to these has not been the cause of more error respecting it than any other circumstance, as they are observable only in the three first varieties, and even of them it is by no means uncommon to meet with specimens wholly destitute of them. I would, therefore, recommend the specific distinction to be considered as depending chiefly upon the tumid apices of the fructifying shoots, in which case there would be no possibility of confounding it with any, except the following, its differences from which are more particularly mentioned under that species. I have altogether omitted noticing the Linnæan *F. diva-*



ricatus, having found the circumstance on which it depends to be extremely uncertain, and seldom, if ever, observable in all the branches of the same individual. Linnæus' specimens of this, and his *F. inflatus*, in his own Herbarium, were peculiarly calculated to mislead him; both of them being very small, and merely either young shoots, or fragments of branches. One of the former, however, has the segments divaricated, even without the presence of a vesicle, of which I never saw any other instance. With regard to the synonyms of this *Fucus*, I do not presume to think I have quoted all which it would have been possible for me to have found; but I have endeavoured to do what I could, and the evident difficulty of the task must plead my excuse for omissions or errors upon this head. I must now add a few words upon the uses to which the present species has been applied; in which I cannot do better than copy what has been already written by the author of the *Flora Scotica*, who has carefully enumerated, and had better opportunities of observing them than I am at present likely to possess. "It is well known to be an excellent manure for land, to which purpose it is often applied, in the maritime parts of Scotland and other countries. In the islands of Jura and Skye it fre-



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quently serves as a winter food for cattle, which regularly come down to the shores at the recesses of the tides to seek for it. And sometimes even the stags have been observed, after a storm, to descend from the mountains to the sea-fides, to feed upon this plant. Linnæus informs us, that the inhabitants of Gothland in Sweden, boil this *Fucus* in water, and mixing therewith a little coarse meal or flour, feed their hogs with it; for which reason they call the plant Sweintang. And in Scania, he says, the poor people cover their cottages with it, and sometimes use it for fuel. In Jura, and some other of the Hebrides, the inhabitants dry their cheeses without salt, by covering them with the ashes of this plant; which abounds with such quantity of salts, that from five ounces of the ashes may be procured two ounces and a half of fixed alkaline salts, that is half of their whole weight. But the most beneficial use to which the *F. vesiculosus* is applied, in the way of œconomy, is in making pot-ash or kelp, a work much practised in the western isles.—The manner of doing it is this: The plant is collected and dried carefully upon the shore in small heaps. When thoroughly dry, a pit is dug in sandy ground, about seven feet wide, and three deep, lined with stones. In this pit a fire is kindled.



with small sticks, and the dried Fucus is laid upon it by little and little, and burnt. When a sufficient quantity is consumed for the purpose, and burnt to a certain degree, it appears in the pit like red-hot ashes. The operator then, to prevent its being reduced entirely to ashes, with an iron rake stirs about briskly this hot matter from one side of the pit to the other, mixing it well together, till at length it begins to congeal, and vitrify. The salts being now all melted, the matter is left to cool in the bottom of the pit, where, as in a mould, it concretes into a solid mass, called Kelp, which, when cold, is broken out of the pit, and carried to market for the use of the soap and glass-makers. There is great difference in the goodness and price of this commodity, and much care and skill required in properly making it. That is esteemed the best which is hardest, finest grained, and free from sand or earth. The price of Kelp in Jura is 3l. 10s. per ton, and about forty or fifty tons are exported annually from that island. So great a value is set upon this Fucus by the inhabitants of that place, that they have sometimes thought it worth their while to roll fragments of rocks and huge stones into the sea, in order to invite the growth of it. Its virtues in the medical way have been much celebrated by Dr. Russell, in



his "Dissertation concerning the Use of Sea-Water in the Diseases of the Glands." He found the saponaceous liquor or mucus in the vesicles of this plant to be an excellent resolvent, extremely serviceable in dispersing all scrobutic and scrophulous swellings of the glands. He recommends the patient to rub the tumor with these vesicles bruised in his hand, till the mucus has thoroughly penetrated the part, and afterwards to wash with sea-water. Or otherwise, to gather two pounds of the tumid vesicles, in the month of July, when they are full of mucus, and infuse them in a quart of sea-water, in a glass-vessel, for the space of fifteen days, when the liquor will have acquired nearly the consistence of honey. Then strain it off through a linen cloth, and rub this liquor with the hand, as before, three or four times a day, upon any hard or scrophulous swellings, washing the parts afterwards with sea-water, and nothing can be more efficacious to disperse them. Even schirrosities, he says, in women's breasts have been dispelled by this treatment. The same author, by calcining the plant in the open air, made a very black salt powder, which he called Vegetable Æthiops, a medicine much in use as a resolvent and deobstruent, and recommended also as an excellent dentifrice, to correct the scrobutic



laxity of the gums, and take off the foulness of the teeth."

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### 25.—FUCUS CERANOIDES.

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F. fronde sub-dichotomâ lineari integerrimâ sparsim pinnatâ; pinnis multifidis sub-radiatis, apicibus tuberculiferis lineari-lanceolatis tumidiusculis acuminatis.—Herb. Linn.—Buddle, p. 6. n. 3.—Buddle and Vernon, p. 21. n. 4.—Sp. Pl. p. 1626. (excl. syn. Morif.)—Linn. Transf. iii. p. 149. (excl. syn. Fl. Ang. Fl. Scot. Gmel. et With.)—Fl. Suec. p. 430.—Fl. Lapp. p. 366.—Fl. Carn. ii. p. 403.?

β. fronde apicem versùs vesiculoso-inflatâ.

Near Christ-church, in Hampshire, Dr. Goode-nough.—North Wales, Rev. H. Davies.

Perennial;

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Root a small, expanded disk; frond above a foot high, composed of a strong, prominent, but compressed, black midrib, divided at the distance of an inch or two from the base, and continuing with frequent, irregular dichotomies at uncertain



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distances, their angles generally acute, to the very summits, except in the tuberculiferous shoots, when, as in its congeners, it ceases to be visible where the fructification begins: on each side it is winged with a flat membrane, entire at the margins, forming linear branches, about a quarter of an inch wide, the sides whereof are pinnated with a few scattered, distichous shoots, far narrower than the rest of the frond, simple immediately at their origin, but soon divided in a sub-palmate, radiated manner into numerous segments, which often again and again branch in a similar mode into others still more narrow, the extreme ones in that respect hardly exceeding a single line; the terminations of these, when sterile, are so blunt as to be almost truncated, and are either quite entire or emarginate; when in fruit, their length is generally extended to near an inch; their form is lineari-lanceolate; they are slightly swelled, so as to be compressed rather than cylindrical; they are often bifurcate, and always end in very sharp points. The greatest length of these side-shoots does not appear to be more than two inches, and they grow still shorter as they approach the summit of the frond. The foliaceous membrane on both sides of the midrib is perforated with small, mucifluous punctures. The swollen tuberculi-



ferous summits are, as in *F. vesiculofus*, full of a clear, gelatinous, colourless mucus, among which the seeds lie imbedded, in clusters each containing about twenty, under perforations in the frond, through which, when mature, they escape. The substance of this *Fucus* is between coriaceous and cartilaginous; its colour a yellowish brown. In all the specimens I have seen, the base of the nerve, deprived of its membrane, is pinnated with numerous, small, oblong, sometimes bifid, shoots. This species is destitute of vesicles.

$\beta$  differs only in the upper branches being inflated in a manner precisely similar to the second variety of *F. vesiculofus*.

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The error that so long existed respecting the plant intended in the *Species Plantarum*, under the name of *F. ceranoides*, was first cleared up by the authors of the excellent "*Observations on the British Fuci*;" and the authentic specimen in the Linnæan Herbarium fortunately removes the case beyond all possibility of doubt. To trace mistakes is generally an useless, and always an unthankful office, but in the present case it may be worth while to observe, that the confusion arose from Linnæus having called by the name of



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crispus, what all preceding writers had known by that of ceranoides, and having, under the present species, referred to Morison's t. 8. f. 13, which unquestionably belongs to the other. The only wonder is how subsequent authors could reconcile his description to the plant they supposed him to have designed; but it always is, and always must be the case, that a matter once considered certain is never afterwards doubted, and continues to pass current, till, when discovered by any fortunate accident or superior penetration, the illusion instantly vanishes, and every body wonder how they could have been so long deceived. Scopoli alone, in his Flora Carniolica, seems to have avoided the general error, but whether he precisely knew the true Fucus may be justly doubted, as he describes it with leaves still broader than those of *F. vesiculosus*. For the reasons already mentioned under the preceding species, I have referred Gmelin's *F. filiformis*, Hudson's *F. linearis*, and Lightfoot's *F. distichus* to the seventh variety of that, rather than to the present, which, as far as I can find, seems to have escaped the notice of most writers, and is probably one of the rarest of our Fuci. I have never had an opportunity of seeing it in a perfectly recent state, and should therefore be



sorry to expose myself to the charge of speaking too positively upon the subject ; but, in the specimens Mr. Davies has been so good as to send me, its habit and mode of growth are widely dissimilar to those of *F. vesiculosus* ; the fruit not being situated in the summits of the leading branches, which are broad and truncated, but in short, palmate side-shoots, divided into numerous, narrow, linear segments, not unlike the horns of some species of deer, their apices very short and blunt when barren, but acuminate and long at the time of fructification. The sharp lineari-lanceolate pods, or the absolute want of vesicles, would not be sufficient, without this additional circumstance, to keep the plant separate from the foregoing species. Its colour, moreover, is very different, and its texture far less coriaceous. The frond appears occasionally to be twisted in a spiral manner, and the angles of the dichotomies, though generally acute, are sometimes rounded, or even divaricated ; it possesses also the proliferous tendency in case of injury, so that, should it be allowed to remain, as I believe it will, specifically distinct from *F. vesiculosus*, its near affinity to that species in all its greatest peculiarities, must be considered as truly wonderful.

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26.—FUCUS MEMBRANACEUS.

F. fronde lineari dichotomâ membranaceâ punctatâ diaphanâ tenerrimâ; nervo undulato sparsim prolifero.—Ner. Brit. p. 13. t. 6.

On the shore at Sidmouth, Mr. Stackhouse.

Annual?

Root a minute disk, whence arises a winged frond, six inches or more in height, composed of a very thin, scarcely prominent, dark-coloured, undulated midrib, not much larger than hair; black at its origin, but growing more faint by degrees, till at the ends of the branches it almost ceases to be visible; frequently dichotomous with roundish angles, and from top to bottom winged with thin, membranous, linear leaves, finer than gold-beater's skin, which in substance and appearance they much resemble; above half an inch wide, perfect at their margins, and ending in acute, bifid, or trifid summits; studded throughout with dark, roundish, scattered spots, disposed without regularity on both sides of the midrib,



and equally visible on either surface of the leaf. Besides these, the nerve is proliferous with a few, scattered leaves, oblong and simple at their origin, but soon becoming forked; and in every respect, except their smaller size, resembling the plant from which they spring. The frond, viewed under a microscope, is curiously and most minutely reticulated; its colour a pale yellow, very slightly tinged with brown.



There can be no fear of confounding this *Fucus* with any other British species, its wonderfully thin substance, undulated, proliferous midrib, and spotted frond, keep it perfectly distinct, and entitle it to be considered, in every point of view, as a plant completely "*fui generis*." To the marine botanist it is highly interesting as a link in the chain of submersed algæ, strongly tending to unite the genera of *Fucus* and *Ulva*, with both of which it has so great an affinity, that, till its fructification is discovered, its place in the system must be considered as somewhat uncertain; though, for the present, its winged frond induces me to join the learned author of the *Nereis Britannica*, in referring it to the former genus. The singular black dots observable



upon it are of no regular form, and under the microscope exhibit no constant appearance, so that I should have been inclined to consider them as accidental, had they not been equally present on all the plants I have had an opportunity of observing. Mr. Stackhouse is of opinion that they contain the fructification, and Mr. Woodward, that they are clusters of *Confervæ*, but I must own that my glass will not enable me to accede to either of these opinions, and I can therefore only leave the matter in perfect doubt. There is a very large specimen of this *Fucus* in the Linnæan Herbarium, marked *F. distichus*, a species with which it is surprising that Linnæus should have confounded it, as they are so perfectly distinct in texture, form, and every other circumstance. His description of that plant, however, in the 12th edition of the *Systema Naturæ*, was evidently made only from his other specimens, all which are the true *distichus*, a very distinct coriaceous species, nearly allied to the narrow varieties of *F. vesiculofus*. I believe that only two native specimens of *F. membranaceus* are known to exist in England; one in the possession of Sir Thomas Frankland, Bart. the other in that of its first discoverer, Mr. Stackhouse; which latter, through his kindness, is now before me; and from it,



assisted by some smaller ones, given me by Dr. Smith, from Ceylon, and by a military friend from Minorca, the present description is drawn up. I am conscious of its imperfection, and wish it had been in my power to have made a better from the materials in my possession; but for the present I fear a perfect account of this plant is likely to remain a desideratum; its texture being so wonderfully fine that, when once dried, it is no longer possible to separate the different branches, without total destruction.

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27.—FUCUS ALATUS.

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F. fronde membranaceâ tenerrimâ sub-dichotomâ; laciniis alternis decurrentibus; tuberculis globosis sessilibus.—Buddle, p. 12. n. 3, 5, 6. p. 27. n. 2. (covered with *Flustra pilosa*).—Petiver, p. 25. n. 4.—Gmelin, p. 187. t. 25. f. 1.—Ner. Brit. p. 79. t. 13.—Fl. Dan. t. 352.—Linn. Mant. p. 135.—Syst. Nat. p. 718.—Esper, p. 20. t. 3.—Linn. Transf. iii. p. 142.—Fl. Scot. p. 951.—Fl. Ang. p. 578. With. iv. p. 95.



*Fucus dichotomus parvus costatus et membranaceus.*—R. Syn. p. 44. n. 20.

..... *purpureus tenuitè divisus non geniculatus.*

—Moris. Hist. Ox. iii. p. 646. n. 15.

$\beta$ . *fronde latiore, marginibus undulatis.*—Gmelin, p. 187. t. 25. f. 3.

$\gamma$ . *fronde angustissimâ; nervo membranâ laterali ferè destituto.*—Gmelin, p. 187. t. 25. f. 2.

$\alpha$  is not uncommon on the southern and western coasts of Britain;  $\beta$  was found at Weymouth;  $\gamma$  at Scarborough, Mr. Pitchford.

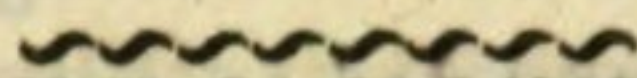
Perennial?—June—August.

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Root an expanded disk, from which arise numerous fronds, about four inches long, and two lines wide, consisting of a narrow, compressed nerve, winged from the very base with a thin, foliaceous membrane, and extending through all the shoots to the extremities, but gradually decreasing in thickness, so that at the last it almost ceases to be perceptible. In full-grown plants, ramification takes place about an inch from the root, and the frond continues to be divided in a manner between dichotomous and distichous, the branches growing more numerous as they approach the apices, and being there disposed in a regularly

alternate manner, decreasing in length in proportion as they are nearer to the end, and their summits bifid with sub-incurved, linear segments, often so short as to be more properly only emarginate. The edges are throughout flat and entire; the nerve at the base, where the attrition of the waves makes it bare, is sometimes nearly cylindrical; the segments are all slightly dilated upwards. At the time of fructification, many small, lanceolate processes, similar in substance to the leaf, shoot out from the midrib, and ends of the branches; the centers whereof swell into minute, transparent globules, which contain a great number of dark seeds, imperceptible to the naked eye, but easily visible with the help of a common glass. These globules in time disappear, and the seeds lie scattered on the processes, which seem to be real pods, as they afterwards break off. Sometimes the seminiferous tubercles are also situated upon the midrib, near the summit. The substance of the plant is throughout very tender; that of the leaves membranous, and extremely thin: the colour of the whole is a fine rose-red, which changes in decay to a dull, sandy hue, and often to pale green. Towards the root the nerve is darker than the rest of the frond, and in some specimens almost black.

β differs in the greater width of its branches, some of which, in that respect, almost equal half an inch; its margins too are undulated.

γ , even in its leading shoots, is scarcely two thirds of a line wide, and in its youngest ones, nearly capillary; it appears throughout as if stripped of the lateral membrane.



The resemblance in colour, texture, and general appearance between *F. alatus* and *ruscifolius* is so extremely great, that it is impossible not to regret the necessity of separating them, occasioned by the present arrangement. This resemblance is considerably increased by the leafy part of the frond in this species exhibiting, if held to the light, or viewed in water, what to a cursory glance appears the same striæ as those so remarkable in the other; but what, if more attentively examined, will be found not to be series of pellucid veins, but ramifications of the midrib, similar to those of *F. sanguineus* and *sinuofus*. The mode of fructification in this plant is singular, on account of the tubercles not being situated on the nerve of the leading shoots, but on that of minute, leafy processes issuing from it; the deciduous nature of which seems to prove the frond perennial: the appear-

ance of the fruit may fairly be concluded to be very rare, as it has escaped the notice of most authors on the subject. The second variety of this work is far broader than Gmelin's figure above quoted, and its colour is as deep as that of any specimen I ever saw of *F. sanguineus*; but the terminations of the branches leave no question as to the species to which it belongs. The variety γ may possibly be regarded as more doubtful; and, were not the specimens of it fine and vigorous, I should join the number of those who might be inclined to account for its almost total want of the lateral membrane, on the supposition of its having sustained an injury. That however seems impossible; and the above reasons, added to its being full-grown and in fruit, render Gmelin's idea of its being only a young plant equally improbable. Professor Esper, in his t. 3. f. 3. has figured what he considers a long-leaved variety of *F. alatus*, which seems a strangely intermediate plant between that and *F. hypoglossum*. He has represented the leaves with punctures like those of *F. ferratus*, and calls them the fructification; but they are so unlike the real fruit of the plant, that, either they must be the effect of accident, or, what I rather incline to think the case, he must have blended some other species with the present,

than which no more beautiful and elegant *Fucus* exists in the British List; nor is any, except perhaps *F. sanguineus*, a more universal favourite with collectors.

28.—FUCUS DENTATUS.

F. fronde membranaceâ ramosâ sub-enervi alternatim-pinnatifidâ; ramulis linearibus apice incis, laciniulis acutis; fructu racemoso.—Herb. Linn. —Syst. Nat. p. 718.—Linn. Mant. p. 135.—Fl. Ang. p. 582. (excl. syn. Gmel.)—Ner. Brit. p. 95. t. 15.—Fl. Scot. p. 952.—Linn. Transf. iii. p. 158.—With. iv. p. 102.—Fl. Dan. t. 354.—Fl. Norv. ii. p. 91.

Fucus atomarius.—Gmelin, p. 125. t. 10. f. 1.
..... membranaceus rubens, foliolis latiusculis ad extremitates dentatis.—Moris. Hist. Ox. p. 646. s. 15. t. 8. f. 5.

In the Frith of Forth, and upon the coasts of Jona, plentifully, Lightfoot.

Perennial.

Root a callous disk; frond from four to seven inches long, and about two lines wide; narrow, compressed, and stiff near the root, but soon expanding into flat, thin shoots. It is divided at a small distance from the base with once or twice repeated dichotomies, forming branches, which are pinnatifid with obtuse angles into distichous, alternate segments; the lowest longest, the rest gradually shortening as they approach the apices of the plant: these are sometimes again divided in the same manner, the extreme shoots being always linear and entire, except at their summits, where they are truncated and cleft into three or four subulate, sharp teeth, which, did the growth of the plant allow it, would undoubtedly furnish a new set of branches, in every respect like the former. In all my specimens, a faint appearance of a midrib is perceptible from the base to the summit of every branch, very broad and dark-coloured at first, but gradually decreasing in both these respects. The fructification of this plant consists of small bundles of minute, linear-lanceolate, black, cylindrical pods, growing upon a common peduncle from the alæ of the extreme shoots; each of them is supported on a short partial pedicellus, about a line long, and contains six or eight black, round seeds, disposed in pairs in

two regular rows. The substance of this Fucus is flexible, but tough; hard and rigid towards the base, membranaceous in the branches, yet not without a tendency to coriaceous: the young shoots are very tender and delicate, of a pale-pink colour; the rest of the plant of a dark dull red, by no means transparent; deeper in the middle of the branches, and almost black near the root.

The situation of this elegant plant in a natural arrangement of the British species, would be between *F. alatus* and *pinnatifidus*, with both whereof it has many points in common; but there are foreign Fuci to which it is far more nearly related, and especially the *F. corymbiferus* of Gmelin, where its affinity is so great, that, before the arrival of the Linnæan Herbarium, (when that was found to be the * *F. cristatus* Linn.) little doubt was enter-

* No plant under the name of *F. cristatus* appears to be described in any of Linnæus' works, and it must therefore be supposed either that the specimen in question was intended to have been so called in some future publication, or that he purposed writing *cristatus*; which latter idea there

tained of their identity. Since that period, the case has been entirely settled by the fortunate discovery of the fruit of *F. dentatus*, for specimens of which I am indebted to Mr. Stackhouse and Mr. Sowerby; that from the latter gentleman gathered on the northern coast of Ireland, by Mr. Brown, who is now engaged in a voyage of discovery, on his return from which, the world may hope for much light to be thrown on these vegetables, from his known attachment to them, and his still more known acuteness. The mode of fructifying that takes place in this *Fucus*, brings it near to *F. subfuscus*, with which in other respects it is unconnected: in the faint appearance of a nerve in the center of the frond, it manifests some

would be no hesitation in adopting, but that the description of that plant in the *Systema Naturæ* agrees far better with our *F. laceratus*, to which Baron Wulfen and most other authors have referred it. Indeed no botanist, acquainted with Linnæus' eminent skill in availing himself of the most characteristic marks of every species, can well suppose it to have been designed for Gmelin's *F. corymbiferus*, of which it embraces hardly any of the most prominent peculiarities,

affinity to *F. rubens*; and in the substance of the leaf, at least in old plants, it approaches closely to the coriaceous *Fuci*, though at the same time it is every where so thin, that it cannot but be considered as membranaceous. To observe this latter circumstance properly, it must be examined in water. A great singularity attending it consists in the edges of the branches, when viewed through a glass, appearing as if ciliated with very small pedunculated processes; for the use whereof it would not be easy to offer a plausible conjecture, as they do not appear to lengthen into new shoots, and certainly are not intended to support the fructification. Nothing can be worse than Gmelin's figure above quoted; indeed it is so bad, that a suspicion may justly be entertained how far it was really intended for the plant in question, and whether it might not possibly be designed to represent some other, of which there is no account in his work; as is the case in his *F. abies marina*. His description on the contrary is extremely good, and agrees well, excepting what he says about the whole being covered with minute dots or atoms, whence he has derived the name; these, however, were most probably owing to some casual circumstance.

29.—FUCUS LACERATUS.

F. fronde membranaceâ tenerrimâ sub-venosâ ramofo-dichotomâ; ramis linearibus obtusis, marginibus crispo-lacinulatis undulatis; tuberculis immerfis.—Gmelin, p. 179. t. 21. f. 4.—Linn. Transf. iii. p. 155.—Ner. Brit. p. 77. t. 13.

Fucus crispatus.—Fl. Ang. p. 580.—Wulfen in Jacq. Coll. iii. p. 162. t. 16. f. 2.—Esper, p. 130. t. 90. (excl. fyn. Fl. Dan.)—Syft. Nat. p. 718. ?—Fl. Norv. ii. p. 32. ?

..... cristatus.—With. iv. p. 103.

..... endiviæfolius.—Fl. Scot. p. 948. t. 32.—With. iv. p. 103.

β. papyraceus—ramis ramulisque tenuioribus subfinuatis.—Linn. Transf. iii. p. 155.

γ. pumilus.—fronde subrotundâ; ramis dilatatis sub-indivisis, apice lobatis.

α is found on most parts of the British coast; **β** at Ilfracombe, Dr. Goodenough; **γ** at Yarmouth, but very rarely.

Annual?—September—October.

Root a minute callus ; fronds numerous, at first closely embracing the substance on which they grow, and creeping along it, not by means of fibres, as in most other Fuci, but by their margins, which adhere firmly to the stems of the larger species, &c. hardly suffering themselves to be detached without laceration. Hence they are unprovided with any stipes, but rise flat and membranous from their very origin : their usual height is from four to eight inches, and their breadth less than the half of one. Most frequently they are divided very near the base, and continue branching in an irregularly dichotomous manner to the extremities, which are short, rounded, and either bifid or palmate : the length of the segments is for the most part the same, and their breadth subject to but little variation from base to summit. The margin is every where, when fresh, undulated, and, though occasionally entire, in general minutely lacerated in a singular manner ; often ciliated with a profusion of small, ovate, leafy processes. The whole plant is occasionally found with a curled appearance. One of its most striking peculiarities lies in the veins, which arise from the root, of a colour much darker than the rest of the frond, but not of a thicker substance ; and which, running in somewhat parallel lines, but irregularly branching

and anastomosing, continue to be visible for two or three inches, till, their colour gradually fading, they become totally imperceptible to the naked eye. The fruit of this species consists of globular tubercles, nearly as large in circumference as turnip-seed, but almost entirely flat, immersed in the substance of the frond, and hardly projecting; sometimes irregularly scattered over all parts of the surface, and sometimes confined to the leafy marginal processes. Their colour is a very dark red, and the seeds are, in their fresh state, easily visible in them. *F. laceratus* is of a substance membranaceous and thin beyond all others of the same division: its colour is a pale, diaphanous red, tinged with brown, and changing in decay to yellow. If examined with a strong glass, the frond is perfectly pellucid, and appears composed of minute network, formed by colourless veins anastomosing, and including oblong, irregularly-hexagonal, pink meshes, interrupted at short distances by longitudinal, branching veins, reticulated in a similar manner; but more transparent, having their meshes cylindrical, and so conspicuous, that the frond seems striated from them.

β agrees with α , except in the smaller size of all its parts; its branches are very numerous, and extremely short, as well as narrow.

γ is remarkable for the almost circular form of its outline; its frond hardly exceeds an inch in height, and is divided near the root into three or four branches, somewhat narrowest at their base, and quite entire, except that their summits are cleft into a few oblong, rounded lobes; it is of a very delicate pale rose-colour.

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From what has been just observed respecting the appearance exhibited by this Fucus under the microscope, it must be clear that, though allowed at present to remain in the division of those which have \* “flat veinless leaves,” it is nevertheless provided with a regular and curious system of veins, by no means dissimilar in effect to those of *F. ruscifolius*, and most probably designed by na-

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\* To avoid all possibility of confusion or mistake on this head, it has appeared best to alter the title of this division from “fronde planâ aveniâ,” to “fronde planâ enervi”; the latter term being used in botanical language among these plants, to express the absence of a midrib, upon which depends this division, in opposition to those whose fronds are winged.



ture to answer the same purpose in the œconomy of the vegetable. In these consists one of its most striking peculiarities, but they are far from being equally conspicuous in all specimens, and in young ones are so faint as to be invisible, except with the assistance of a glass. This plant however has many other characters almost altogether peculiar to itself; among which is to be reckoned the singular mode in which the shoots for the most part terminate; their summits being divided into a few very short, rounded segments, one or two similar to which are placed a little way below them on the branches, so that, in many cases, they may be called sinuated, and approach nearly to the mode of ramification observable in *F. sinuosus*. Not less remarkable are the globular, seminiferous tubercles always immersed in the substance of the frond, and sometimes scattered without any apparent order over the whole of the branches, while at others they are confined exclusively to the marginal leafy processes. The manner in which *F. laceratus* fixes itself to the substances whereon it grows by its edges, indicates a close connection with *F. bifidus*, from which, however, its mode of ramification, &c. make it sufficiently distinct at first sight; and, spite of this adhesive property, the branches do not seem to connect themselves



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with each other by means of it, as is the case in that Fucus. The variety  $\beta$ , which is here introduced almost wholly on the authority of Dr. Goodenough, approaches, in some stages of its growth, according to that gentleman, very near to *dentatus*, and creeps in great abundance round the edges of the basins in the rocks at Ilfracombe, making a beautiful appearance. The following plant is that with which the present has the closest natural affinity, and many authors have joined them together: in this case I have differed from them in opinion, and my reasons for so doing will be found under that species. Baron Wulfen has given an admirable account and figure of *F. laceratus* in an early stage, under the name of *crispatus*, supposing it to be what Linnæus designed in his *Systema*: I have however quoted that reference with a mark of doubt, as, though the description agrees extremely well, there is no specimen so named in his *Herbarium*, and *crispatus* is so very near in sound and orthography, that the writing one word for the other might easily have taken place, notwithstanding the utmost caution. The *F. crispatus*, figured in the *Flora Danica*, t. 826, is nothing more than a variety of *F. crispus*, and so different, that it is wonderful the authors of that work should have fallen into such an error. From



Gmelin's figure above quoted, there can be no doubt of his *F. laceratus* being the same as ours; but surely a question may fairly be asked, whether his *F. volubilis* is any thing else than a variety of it; and Ginanni's t. 27, to which he refers, will hardly be allowed, by any botanist acquainted with the true Linnæan plant of that name, to have much weight in opposition to such an idea. *F. venosus*, of Linnæus' 2nd Mantissa, p. 312, approaches nearly to this species, and the veins from which it takes its name, though much thicker in substance, and more numerous, wear a striking resemblance to those of *F. laceratus* above mentioned; but that plant, as Dr. Smith pointed out to me, certainly belongs to the genus *Ulva*, and bears the fructification in single, scattered seeds near the base. It only remains to add, that the tender substance of *F. laceratus*, which renders it susceptible of the slightest injury, and its curiously lacinulated edges give rise to the name; but that Lightfoot's appellation of *F. endiviæfolius* is so much more characteristic, particularly of the plant in a recent state, that there is reason to regret its having been discontinued.

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### 30.—FUCUS LACINIATUS.



F. fronde sub-membranaceâ ramosâ; ramis dilatatis palmatis obtusis, marginibus planis.—Fl. Ang.

p. 579.—Fl. Scot. p. 947.—With. iv. p. 102.

Fucus laceratus.  $\gamma$ .—Linn. Transf. iii. p. 156.

..... ciliatus.—Gmelin, p. 176. t. 21. f. 1.

(excl. syn. Morif. et Raii.)

..... crispus.—Esper, p. 41. t. 18. (excl. syn. omn. præter Gmel.)

..... crispatus.—Ner. Brit. p. 92. t. 15.

In Cornwall, Mr. Stackhouse.—Among the rejectamenta of the sea at Yarmouth, but rarely.

Annual?—February—May.



Root an extremely small callus; frond in general solitary, seldom exceeding three inches in height, and cleft into segments often an inch wide; expanding immediately from the base, and continuing gradually to widen, so as to form in its outline, when floating in water, according to Light-foot's observation, a large segment of a circle, the



utmost breadth whereof is often greater than the length. It begins to be divided at a very short distance from the root, almost always in a palmated manner, rarely dichotomous, into shoots that again dilate, and again, at uncertain distances, continue to branch in the same mode to the extremities, which are multifid with narrow, short, linear, and slightly-rounded segments. Not unfrequently, especially among old plants, specimens may be found where the primary branches continue simple, and nearly of the same width throughout, till they approach their apices, when they suddenly expand, and become palmate in the manner before mentioned. The frond is every where perfectly destitute of veins; the margin quite flat, even when, as in *F. laceratus*, it is ciliated with short, minute, crisped leafy processes, which, according to the remarks in the Linnæan Transactions and Flora Scotica, contain roundish tubercles, full of dark seeds, visible by the help of a microscope. The substance of this *Fucus*, when fresh, is tough, and sub-cartilaginous; but, after it is dry, it becomes more thin and membranous. Its colour is a bright and pleasant, but opaque red, which changes to white. Even viewed through a microscope, the frond is by no means diaphanous, and the surface appears very obscurely reticulated, with veins



forming roundish, obsolete meshes, which however, if a glass of very strong power be applied, cannot be distinguished.



The form of the frond, and mode of its ramification, as well in the present as the preceding *Fucus*, are circumstances liable to so much variation, that, were there no better criterions for distinguishing them, few botanists would venture upon pronouncing them specifically distinct: and yet, at the same time that this is granted to be the case, it would be no less wrong to run into the opposite extreme, and, because implicit reliance is not to be placed on these circumstances, therefore to reject them entirely, and allow them no weight whatever; as, however strangely single specimens differ, it is certain that the branches of *F. laciniatus* are more palmate than those of *F. laceratus*, the outline of its frond more regular, and the general habit very dissimilar. The most essential proofs of distinction between them appear to consist in the difference of their substance, a mark no less conspicuous in young than in old specimens; but, to judge of which properly, it is necessary they should be examined together in water; in the pellucid veins, so singular in one species, but



wholly wanting in the other; in the dissimilar appearance they exhibit under a microscope, and in the diversity of their colours, a circumstance liable to far less variation in the aquatic than in the terrestrial plants, and on which, in the investigation of the marine Algæ, considerable dependence must often be placed. The synonymy of *F. laciniatus* has been much confused, and few species have been in general less understood: its being a plant of by no means common occurrence will account for its having escaped the observation of the older writers. From Gmelin's description, as well as his figure, there can be little doubt of Hudson's being right in considering it the *F. ciliatus* of that author, though he has unfortunately erred in his references to Ray, Morison, and the *Flora Anglica*. His *F. laciniatus*, on the other hand, seems to be our *F. rubens*. Professor Esper has supposed the present plant to be the *F. crispus* of Linnæus, in which he is no less mistaken, and has quoted Morison's t. 8. f. 5. our *F. dentatus*; and Æder's *Fl. Dan.* t. 769, the *F. minutus* of that work, which most probably belongs to *F. rubens*; together with Gunner's *Ulva delicatula*, *Fl. Norv.* t. 8. f. 2, which, though supposed by the reverend author to be only a variety of *F. crispus*, seems most evidently intended



for Mr. Woodward's *Ulva ligulata*, and is a good representation of some appearances of that plant.

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### 31.—FUCUS BIFIDUS.

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F. fronde membranaceâ dilatatâ sub-dichotomâ, marginibus conglutinatis; tuberculis marginalibus sparsis.—Fl. Ang. p. 581.—Linn. Transf. iii. p. 159. t. 17. f. 1.—E. B. t. 773.—With. iv. p. 103,

$\beta$ . fronde lineari, marginibus ciliatis, apicibus lanceolatis acutis.

$\gamma$ . fronde irregularitèr ramosâ, apicibus sub-ovalibus acutis.

$\delta$ . fronde sub-palmatâ.

$\alpha$ ,  $\beta$ , and  $\gamma$  are found among the rejectamenta of the sea at Yarmouth;  $\delta$  on the shores of the Isle of Wight.

Perennial?—September—January.

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Root expanded, thin, scarcely callous; creeping, and investing with its numerous fibres, the stems of larger Fuci. Fronds numerous, of various



height, generally less than one inch, but sometimes rising to nearly three; and from one to three lines broad: always, at intervals, connected together at their margins, so as to present, when fresh, a globular appearance; twice or thrice irregularly dichotomous, and of equal breadth throughout, except towards the extremities, which are slightly dilated, and obcordate with obtuse segments: the angles of the dichotomies are patent, and sometimes divaricated; the margin of the leaves seldom fails of being provided with a few small, oblong, leaf-like processes, serving to glue the fronds in a curious manner to each other, and adhering together so strongly, that they have the appearance of anastomosing; which if they do not do, they stick too firmly for it to be possible to separate them without lacerating the plant. This is by far its most striking peculiarity, and is a circumstance by which it may most certainly be recognised under all its varieties. The seeds lie in small, dark-red spherical tubercles, partly immersed, and partly projecting; changing to blackish as they become ripe, and scattered more or less plentifully along the margin of the frond; as well immediately near the root, as at the very extremities. The substance is particularly thin; colour of a pale, purplish red, turning in decay to white,



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$\beta$  is remarkable for its narrow frond, every where of equal breadth; its terminal segments very long and acute, and its margin more or less closely set with small, almost linear processes, which, as remarked above, adhere firmly to each other, and, as I never observed in this variety any appearance of fruit, are probably analogous to the multiplication of the petals in phænogamous plants.

In  $\gamma$  the frond is nearly an inch wide, neither dichotomous nor palmate, but irregularly branched, with the segments long, and ovato-lanceolate, seldom bifid at the tips.

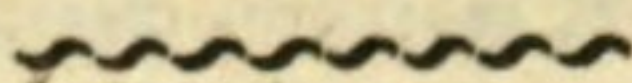
$\delta$  is conspicuous for its palmated divisions, its substance somewhat thicker, and its colour less transparent than that of the preceding varieties.

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This Fucus, though a rare plant, is occasionally found at Yarmouth under three so different appearances, that I have thence formed the three first above-described varieties; all of them extremely unlike at first sight, and all equally removed from the fourth, of which I am able to say very little, as I have seen only a few small specimens of it, which were sent by a friend, who picked them up by chance on the shores of the Isle of Wight.

Mr. Wigg, whose opinion on the subject is, from his experience, entitled to the greatest consideration, has sometimes been inclined to consider the second variety a distinct species; and for my own part, I should have joined that opinion, had I not fortunately been in possession of specimens situated between the two extremes; by which I find that the breadth of the frond, the acuteness or obtuseness of the terminal segments, and the greater or less proportion of the marginal leafy processes, are not circumstances on which entire dependence is to be placed; still less so is the uncertain mode of ramification observable in my variety γ , or the palmated appearance exhibited in δ , which, but for its small marginal tubercles, and total want of veins, might almost as safely be referred to *F. laceratus*, as to the present plant. Gmelin's *F. bifidus* agrees in name only with ours, which I am not aware that any foreign botanist has ever found, or any foreign author mentioned. By attending to the shape and situation of the fruit, and to the adhesion of the edges of the shoots, it is hardly possible to mistake the present for any other species.

32.—FUCUS CILIATUS.



F. fronde sub-membranaceâ pinnato-ramosâ superficie marginibusque ciliatâ; ciliis sub-simplicibus patentibus subulatis apice globuliferis.—Herb. Linn.—Buddle, p. 26. n. 4.—Petiver, p. 19. n. 2, 3.—Micheli's Marine Plants, t. 39. f. 1, 2, 3.—Linn. Mant. p. 136. and p. 519. (excl. syn. Gmel.)—Syft. Nat. p. 718.—Ner. Brit. p. 90. t. 15.—Linn. Transf. iii. p. 160.—Fl. Ang. p. 580.—Fl. Scot. p. 944.—Fl. Dan. t. 353.—Fl. Norv. ii. p. 69.

Fucus holosetaceus.—Gmelin, p. 177. t. 21. f. 2.
—With. iv. p. 104.

..... ligulatus.—Gmelin, p. 178. t. 21. f. 3.
(quoad fig.)

..... membranaceus rubens angustifolius marginibus ligulis armatis.—R. syn. p. 47. n. 33.

..... humilis membranaceus acaulos elegantissimus ruber capillis longis fimbriatus.—Moris. Hist. Ox. iii. p. 646. n. 10.

β. pinnatifidus—fronde lanceolatâ pinnatifidâ, segmentis lanceolatis in longum protensis simplicibus.

γ . palmatus—fronde lanceolatâ sub-nudâ indivisâ palmatâve.

δ . jubatus—ciliis ramosis.—Micheli's Marine Plants, t. 39. f. 4.

Fucus jubatus.—Linn. Transf. iii. p. 162.—Ner. Brit. p. 51. t. 11.

ϵ . lanceolatus—fronde lineari-lanceolatâ ramosissimâ; ciliis divisis.

Fucus lanceolatus.—With. iv. p. 104.

..... ciliatus β .—Ner. Brit. p. 91. t. 15.

ζ . angustus—fronde lineari ramosissimâ, ramis sub-capillaribus angustissimis compressis.

α is found not uncommonly upon the shores of Britain; β and γ at the Isle of Wight: δ and ϵ in Cornwall; ζ at Exmouth, Sir Thomas Frankland.

Perennial?—October—February.



Root composed of a great number of long, filiform, branching fibres, which shoot out into extremely short, cylindrical, undivided stems, and gradually widen into nerveless leaves, very narrow at the base; often extending to the length of above half a foot, and generally about an inch in breadth; for the most part affecting a lanceolate, or lineari-lanceolate form, but variously and irre-

gularly divided into segments of similar shape, which in general again produce others still smaller, and all end in somewhat acute points. The margin is every where ciliated with small, subulate processes, often slightly incurved, either simple or forked, seldom more than a line long, and placed at about the same distance from each other, shooting out in a direction between patent and horizontal: some few of them are also scattered over the surface of the frond, on both sides, without regularity. At the time of fructification, these cilia perform the office of peduncles, their ends swelling into globules, barely so large as the head of the smallest pin, of a pale-pink colour, subdiaphanous, and full of a parenchymous substance, among which the seeds lie imbedded; the extremities of the cilia sometimes project beyond the tubercles, giving the fruit the appearance of that of *Conferva rubra*. The substance of the plant is between cartilaginous and membranaceous, very tough: its colour a dark, opaque red, extremely permanent.

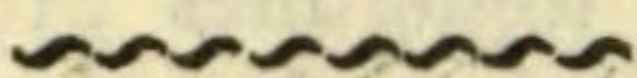
In β the frond is solitary, perfectly lanceolate, and unbranched, except that on either side it is pinnated with very long shoots, also simple and lanceolate; the whole fringed with numerous, undivided cilia.

γ is a really strange appearance, nearly allied to *F. palmatus* both in habit and ramification; its shoots are numerous, stems long, and leaves lanceolate, some quite simple, others palmate with two or three segments; the cilia few and small.

δ varies principally in the strange ramification of its cilia, which are often repeatedly branched, and sometimes extend to an inch or two in length.

ε has its shoots little more than a line wide, lanceolate, and much branched; the cilia are very long, though far shorter than those of the preceding variety.

The whole frond of ζ is compressed rather than flat, and nearly filiform; the branches are very long, end in sharp points, and produce a few spinous cilia.



Mr. Stackhouse, in his description of the present *Fucus*, has with much justice observed, that hardly any species exhibits a greater variety of appearances; and to this he might have added, that the British List does not furnish a single example of one, which is found at different times so unlike itself, and in which the transitions are so little marked by intermediate gradations. Experience alone can in this instance be trusted as a

guide, and even her we ought to follow with considerable caution; but, without such assistance, it would be impossible for any botanist, on seeing the first and last varieties of *F. ciliatus* in this work, to refrain from declaring that they are most distinct species, far more different from each other than either the former is from *F. palmatus*, or the latter from *F. confervoides*. Such being the case, it cannot be regarded as matter of surprize, if authors have entertained a diversity of opinions respecting them; some ranking as new species, what others have looked upon as variations of appearance, arising merely from soil, situation, or any other casual accident. Time alone can discover which of them is right; but for the present it has appeared safest to adopt the latter opinion; because, besides the α and β of this work, none of the varieties have been found in fruit; and, as they principally depend upon the length and ramification of the cilia, it is by no means unfair to suppose that they have originated in some circumstance, which, instead of allowing the plant naturally to produce its fruit, has caused a monstrous and sterile luxuriance. This *Fucus* resembles *F. saccharinus* in the property whence that species derives its name; and, if dried without sufficient care being taken to wash out all saline particles,

will always be covered with a similar whitish efflorescence. Though not very thick, its substance is remarkably tough; but this, according to Lightfoot, does not prevent its being eaten by the Scotch and Irish promiscuously with *F. palmatus*. Both Gmelin's figure and description of his *F. holosetaceus* are very characteristic of our *F. ciliatus*; and, judging also from the engraving, it must be thought that his *F. ligulatus* is merely a variety of so trifling a nature, that it disgraced that great botanist to admit it as a species. But at the same time, if any one will attend to what he says in his account of it, I think he will entertain a different opinion; and, if he still consider it as belonging at all to this plant, will at least allow it must be a very extraordinary and unusual appearance. This is another instance in which the letter-press and figures of the valuable *Historia Fucorum* do not agree. It is singular that, passing two such obvious representations unnoticed, Linnæus, in his second *Mantissa*, should have referred to Gmelin's *F. caulescens*, quite a different species. This seems to be the rock on which Professor Esper struck, and thence in his *Icones*, t. 4. figured, under the name of *F. ciliatus*, some fine branches of *F. vittatus*, together with what from the fruit appears to be an injured piece of *F. laceratus*. Not having

myself an opportunity of examining Buddle's Herbarium, I am consequently ignorant to which of the present varieties his p. 26. n. 1. properly belongs; and have therefore been under the necessity of omitting all reference, as well to it, as to the variety β of the Flora Scotica, and Linnæan Transactions.

33.—FUCUS PALMATUS.

F. fronde membranaceâ utrinque glabrâ palmatâ: segmentis oblongis sub-simplicibus.—Buddle, p. 25. and p. 27. n. 3.—Petiver, p. 19. n. 4.—Uvedale, p. 2. n. 4.—Micheli's Marine Plants, t. 40. f. 1, 2.—Sp. Pl. p. 1630.—Fl. Ang. p. 579.—Fl. Scot. p. 933. t. 27.—Linn. Transf. iii. p. 163.—Fl. Norv. ii. p. 69. Fucus ovinus.—Fl. Norv. i. p. 96.?
 caprinus.—Fl. Dan. t. 1128.—Esper, p. 146. t. 74.
 rubens.—Esper, p. 148. t. 75. (excl. syn. Linn.)
 dulcis.—Gmelin, p. 189. t. 26. (quoad descript.)

Ulva palmata.—With. iv. p. 123.

..... *caprina*.—Fl. Norv. ii. p. 127. t. 6. f. 4.

Fucus membranaceus ceranoides.—R. Syn. p. 46.
n. 29.

..... *foliaceus humilis palmam humanam referens*.

—Morif. Hist. Ox. iii. p. 646. s. 15. t. 8. f. 1.

*Opunzia di membrana finissima, e di color rosso
affai vivido*.—Ginanni, p. 25. t. 25. f. 59?

β fronde oblongâ sub-simplici, marginibus proli-
feris.

F. palmatus.—Ner. Brit. p. 54. t. 12.

Not unfrequent upon most parts of the English,
Welsh, and Scotch shores.

Perennial?



The root of this species is a very small, callous disk, from which spring sometimes one, sometimes four or five fronds, narrow at their base, and in their earliest stage of growth simple and cuneiform; but very soon divided, at first generally in a dichotomous manner, into branches, which continue to widen upwards, and frequently at a short distance, though by no means certainly so, become palmate with three, four, or five oblong segments, either simple, or again cleft in a similar manner towards their apices, where they are somewhat acute, but

always more or less rounded. The height of the frond is from six to ten inches, the width of its principal segments generally little more than one; when fully spread out, it often happens that the total expansion from tip to tip of the extreme branches, measures above a foot. Such is the mode of growth most frequently observable in this *Fucus*; but it is by no means uncommon to meet with specimens where the summit of the leading frond has been broken off, so as to leave only a piece of it about an inch long remaining; in which case the broken part does not seem to increase in size, but throws out eight or ten oblong shoots, whereof some continue simple to the extremities, while the others are divided in the manner above mentioned: occasionally, also, the plant rises with a frond either wholly undivided throughout, or only bifid near the summit. The leaves of this *Fucus* are smooth on each side and flat, but their margins slightly undulated; sometimes entire, sometimes proliferous, as is remarkably the case in the variety β , and sometimes, but rarely, irregularly ciliated with small, short processes, not very unlike those of *F. ciliatus*. In young specimens the frond is flat from its very origin, but in older ones it is supported on a sub-cylindrical stipes, seldom more than one or two

lines long, and gradually losing itself. The fructification, which I have never seen, is described by Dr. Goodenough and Mr. Woodward, as consisting of tubercles, innate in the disk, and gaping at their apices. They mention, also, that the seeds are sometimes found, like granules, dispersed over the whole frond in a manner resembling that of an *Ulva*. The substance, in young plants, is very thin and membranaceous, but in those that have acquired a considerable size stiff, and rather inclining to coriaceous. The colour is a sub-diaphanous, purplish red, extremely light and beautiful in the early shoots, which, when dried, often exhibit a fine glossy appearance. If held to the light, and examined with a glass, the leaf seems composed of very minute, circular cavities, darker than the parts that surround them.

In β the frond is oblong and simple, or only bifid near the summit, and its margin on either side more or less closely ciliated with sub-pedunculated leaves, which resemble it in every respect, excepting their smaller size.

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From the description above given of this *Fucus*, it will easily be perceived that very few species appear under a greater variety of forms;



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though at the same time its variations are of such a nature, that, excepting the very singular one figured by Mr. Stackhouse, the  $\beta$  of this work, scarcely any of them is sufficiently permanent or striking either to deserve or require particular notice. Under the following plant, much has been said of the confusion of synonyms that exists concerning these two so nearly-related Fuci, and the marks that tend most effectually to separate them; there is, fortunately, no other for which they run any risk of being mistaken. Upon the authority of the 2nd Mantissa of Linnæus, I have above quoted Gunner's *F. ovinus*, though still not without some degree of uncertainty; as, from his referring to Ray's n. 16. t. 44, it appears by no means clear that he did not intend one of the varieties of *F. crispus* or *membranifolius*. Professor Esper has twice, under the names of *F. caprinus* and *rubens*, given valuable figures of this species, accompanied by learned, though unfounded, disquisitions upon the synonyms, which, fortunately for us, the presence of the Linnæan Herbarium in England renders it needless to spend time in controverting. If the reference above made to Ginanni be right, he must be allowed to have chosen an eccentric and curious specimen for representation. That figured in the *Flora Danica* is,



also, somewhat singular; and is it not possible that the *F. bullatus* of the same work may belong to *F. palmatus*, which, when kept in fresh water, often exhibits an appearance of irregular tumours on different parts of the frond? Bishop Gunner states that his *F. ovinus* is employed in the fattening sheep and goats, who seek it with much avidity, and betake themselves in great numbers eagerly to the sea shore, at the reflux of the tide, to obtain this pleasant food. Both the figure and description of the present plant in the *Flora Scotica* are excellent.

### 34.—FUCUS EDULIS.

*F. fronde carnosâ cuneiformi sub-simplici utrinque glabrâ, apice rotundato, marginibus integerri-  
mis.*—Buddle, p. 23.—Petiver, p. 17.—Ner.  
Brit. p. 57. t. 12.—With. iv. p. 101.

*Fucus lactuca.*—Esper, p. 129. t. 64.

..... *carnosus.*—Esper, p. 150. t. 76.

..... *dulcis.*—Gmelin, p. 189. t. 26. (quoad fig.)

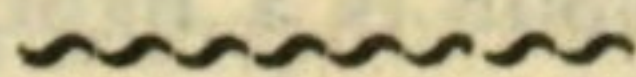
..... *palmatus*  $\beta$ .—Fl. Scot. p. 935.



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At Dover, Mr. Dillwyn; Cornwall, M. Stackhouse; North Wales, Rev. H. Davies.

Perennial?



Root a very small, solid disk, common to numerous fronds, which are from their origin completely cuneiform, having their apices much rounded, and their margins quite flat, as well as perfectly entire. In this shape they for the most part continue, and remain simple, sometimes extending to a foot or more in length, and in their widest part above the half of one in breadth; but occasionally, most probably from accident, they are once or twice longitudinally divided into segments, which, though generally either oblong or dilated, preserve no fixed form or order. Not unfrequently, also, they are irregularly perforated in various parts with numerous, roundish, scattered holes, the edges of which, like those of the segments, prove them not to be natural to the plant. Leaves of various size and age are always to be found from the same root; and it is to be remarked that the proportion of their width to their length generally increases as they grow older. Their surface on either side is smooth, even, and glossy. The stem in the young shoots is flat from



from its very origin, but in mature plants cylindrical, as thick as a crow's quill, and about an inch long before it expands, which it does very gradually. Its colour is a light, sub-diaphanous red: that of the frond a very deep and opaque blood-red, which soon changes to a pale, dirty, whitish green. The substance of the whole is between coriaceous and fleshy in a recent state; apparently hard and horny after it is dry, but when again moistened so extremely tender, that a large plant, if held by the root, is seldom able to sustain its own weight.

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It is difficult to account for this Fucus, which certainly is not one of the rarest among the British species, and of which there are specimens preserved both in Buddle and Petiver's Herbaria, having so long escaped the notice of authors on the subject; or, to speak more correctly, having been so constantly and so entirely confounded with the preceding, that no British writer, except Lightfoot, has thought it deserving of being noticed even as a singular variety. It has, nevertheless, always appeared to me, both in its nature and habit, a perfectly distinct plant; and my opinion being confirmed by Mr. Stackhouse, Mr. Davies,

and Mr. Dillwyn, who have had such repeated opportunities of examining it in its places of growth, I feel no scruple in here introducing it as such; resting its claim principally upon the regularly cuneiform shape of its leaves, their never being either proliferous or branched, and their thick, fleshy substance; all which circumstances appear to be not only constant, but peculiar to it, and not common to any of the varieties of *F. palmatus*. The author of the *Nereis Britannica*, to whom we are indebted both for an excellent description and figure of it, has observed, that "its tender, succulent texture exposes it to the danger of laceration by storms, and its nutritive qualities to the depredation of fishes; and, that, when gathered from its native bed, all the largest leaves, and many of the smaller ones, are found, either half eaten off, or with the frond perforated in numberless places." This latter circumstance is mentioned above, and I have received specimens of it, in which it was so very remarkable, that they were sent under the name of *F. clathrus* of Gmelin, with the figure of which they by no means ill agree, though the description proves them different. Schmidel, who found this plant in abundance, and has given a good account of it in his *Tour through Switzerland, &c.* has made simi-

lar observations ; and added, that he had no doubt but Seba's *Fuci reticulati*, figured in his *Thesaurus* iii. t. 103. a work I have at this time no opportunity of consulting, belong to the present species. The error into which Gmelin seems to have fallen respecting this plant, is both singular and unaccountable ; for his description of *F. dulcis* evidently belongs exclusively to *F. palmatus*, while all his figures seem to have been designed for *F. edulis*, and admit of no doubt, except from being represented with undulated margins. In his notes he clearly confounded them together, and there can be little question but all he has said upon the esculent qualities of his *F. dulcis* refers to the present plant, which Lightfoot informs us, "the inhabitants both of Scotland and Ireland take pleasure in eating : sometimes they feed upon it like a fallad, when fresh taken out of the sea ; but the more usual method is first to dry it, then roll it up together, and chew it like a plug of tobacco. And this they do more for the pleasure arising from habit, than from any supposed virtues in the plant itself. The inhabitants also of the islands of the Archipelago, as we learn from Steller, are very fond of this plant. They sometimes eat it raw, but esteem it most when added to ragouts, oglios, and such like dainties, to which it gives a red

colour, and, dissolving, renders them thick and gelatinous. In the Isle of Skye it is sometimes used in fevers, to promote a sweat, being boiled in water, with the addition of a little butter. In this manner it also frequently purges." * Mr. Stackhouse discovered the quality that it possesses

* "The most surprising quality of this plant, and one that will probably render it of service in dying, I discovered by accident. Having placed some of the leaves to macerate in sea water, in order to procure seeds from it, I perceived on the second day a faint ruby tint, very different from the colour of the plant, which is a dull red, inclining to chocolate colour. Being surprised at this, I continued the maceration, and the tint grew more vivid, till it at last equalled the strongest infusion of cochineal. This liquor was mucilaginous, and had a remarkable property of being of a changeable colour, as it appeared a bright ruby when held to the light, and a muddy saffron when viewed in the contrary direction."

—Ner. Brit. p. 58.—In a note, Mr. Stackhouse adds, "that the Rev. W. Gregor has procured a fine lake from an infusion of it by means of alum."

of yielding by maceration a fine colour; a quality common also to many other algæ, and in the highest degree observable in *Conferva fetacea*, which, after it has been kept only a very short time in fresh water, gives out nearly the whole of the fine lake-tinted fluid with which its tubes are filled, and remains an almost colourless, diaphanous membrane. That even the accurate Ray was not exempt from the universal error, if it hereafter prove to be an error, of not discriminating between this plant and *F. palmatus*, is evident from his saying that the leaves of that species, infused in water, emit a strong scent of violets; a remark applicable with the greatest propriety to *F. edulis*, but not, at least in a striking degree, to the other. In Professor Esper's *Icones* are two most characteristic plates, representing the present species in its two most different appearances.

35.—FUCUS FASCIA.

F. fronde sub-coriaceâ simplici lineari utrinque attenuatâ undulatâ integrâ exstipitatâ.—Fl.

Dan. t. 768.—Roth, Fl. Germ. iii. p. 449.—

Roth, Cat. Bot. fasc. ii. p. 161.

On the north coast of Ireland, Mr. Browne.

Annual ?



Root a small, blackish disk, destitute of any tendency to become fibrous; fronds numerous, four or five inches long, and in their centers about four lines wide; so extremely narrow as to be almost filiform at the base, whence they gradually dilate, till they acquire a size which they preserve throughout, except that, on their approach to the summit, they again decrease, and end in sharp, acuminate apices. They have no appearance, even in the largest specimens, of any stipes of a different substance or form to the rest of the plant. The margins are every where quite entire; the frond exhibits in no part any symptoms of either veins or midrib; in habit it is much undulated, and not unfrequently twisted in a spiral manner. Young shoots are of a greenish colour, and a membranaceous substance; those more advanced are coriaceous, and of a dark, dull, sub-opaque brown. The fructification, according to Dr. Roth, consists of small vesicles, immersed in the sub-

stance of the frond, scattered, but plentiful, marked on their surface with elevated mucifluous warts.



A very considerable part of the preceding description is borrowed from Dr. Roth's admirable Flora Germanica, wherein is contained the only good account hitherto published of this rare Fucus, which that author and his friend Professor Mertens gathered abundantly near Eckwarden in Germany. It was first made known to the botanical world in the Flora Danica, and I have now the pleasure of adding it to the British Catalogue, on the authority of specimens collected on the north coast of Ireland by Mr. Browne, and obligingly communicated to me by that gentleman. He indeed considered, and had marked it an Ulva, to which genus, both from its texture and habit, there can be little doubt of its really belonging; though, never having myself seen it in a state of fructification, I think it best to leave it for the present in the situation where such excellent judges as Oeder and Roth have placed it. The following is the species with which it has by far the closest affinity; but its smaller size and thicker substance, as well as its undulated mode of growth

and want of stipes will distinguish it satisfactorily at first sight, and there is no other in the British Catalogue from which the specific character is not sufficient immediately to point out the difference. It must indeed be allowed that in habit and shape its connection is extremely great with *Ulva compressa* of Hudson, at least that variety of it made, in the *Catalecta Botanica*, a distinct species under the name of *U. lanceolata*; but the colour and texture of the two plants is very dissimilar, and, were any other mark wanting, it would only require to be observed that, though in general apparently flat, the leaf of *U. lanceolata* is in reality always tubular, and, by tearing off the lower part, and applying it to the mouth, will admit of distention like a bladder.

END OF VOL. I.

PRINTED BY F. BUSH, YARMOUTH.

and want of fibres will distinguish it satisfactorily at first sight, and there is no other in the British Catalogue from which the specific character is not sufficient immediately to point out the difference. It will indeed be allowed that its habit and shape its connection is extremely given with *Uva* com-
 plete of *Hedley*, at least that variety of a *Uva* in the Catalogue *Bermudensis*, a distinct species under the name of *U. lancoletus*; but the colour and texture of the two plants is very dissimilar, and were any other mark wanting it would only re-
 quire to be observed that, though in general appa-
 rently like the leaf of *U. lancoletus* is in reality always tubular, and by tearing off the lower part and applying it to the mouth will admit of distinction like a bladder.

Uva com-
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A
SYNOPSIS
OF
THE BRITISH FUCI.

BY
DAWSON TURNER, A. M.

MEMBER OF THE IMPERIAL ACADEMY NATURÆ
CURIOSORUM, OF THE LINNÆAN SOCIETY
OF LONDON, AND OF THE PHYSICAL
SOCIETY OF GÖTTINGEN.

VOL. 2.

Darmouth :

PRINTED BY F. BUSH.

.....
1802.

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DAWSON TURNER, A.M.

MEMBER OF THE IMPERIAL ACADEMY OF NATURAL
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OF LONDON, AND OF THE PHYSICAL
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VOL. I.

Part I.

PRINTED BY T. BURN.

1861

1861

194 FUCUS PHYLLITIS

On the fronds of larger Fucus among the rocks
margin of the sea at Y. Llanrhon.

SYNOPSIS

Root composed of w. diversified, simple
fibres, soft, fleshy, compressed, of equal size
throughout, and of a pale yellowish-brown
level, smooth, and of an inch in width; composed
of a single not an inch in length, but from the
very base, soft, and of a pale yellowish-brown
single leaf, of a lanceolate, or rather, from its great
length, of a linear-lanceolate shape, always, as far
as I have seen, from the base of the leaf, in any way
differing the name of the leaf, but quite entire;
the base is slightly notched, but quite entire.

Root composed of w. diversified, simple
fibres, soft, fleshy, compressed, of equal size
throughout, and of a pale yellowish-brown
level, smooth, and of an inch in width; composed
of a single not an inch in length, but from the
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as I have seen, from the base of the leaf, in any way
differing the name of the leaf, but quite entire;
the base is slightly notched, but quite entire.

OF THE BRITISH FUCI.

36.—FUCUS PHYLLITIS.

F. frondē membranaceâ tenerrimâ simplici lineari-
lanceolatâ integrâ stipitatâ; stipite compresso
brevis.—Ner. Brit. p. 33. t. 9.—With. iv.
p. 100.

F. saccharinus. β .—Fl. Scot. p. 941.?

..... phyllitidis folio.—R. Syn. p. 40.?

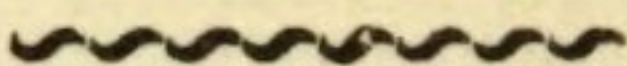
..... longissimo latissimo tenuique folio.—R. Syn.

p. 40. n. 2.?

β frondē apicem versùs dilatatâ sub-cuneiformi.

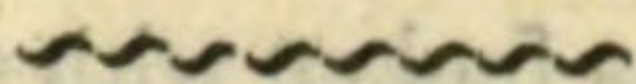
On the stems of larger Fuci among the rejectamenta of the sea at Yarmouth.

Annual?



Root composed of a few divaricated, simple fibres, soft, fleshy, compressed, of equal size throughout, and very short; from which arise several fronds a foot or more long, seldom exceeding three-fourths of an inch in width; composed of a stipes not an inch in length, flat from the very base, soft, and gradually expanding into a single leaf, of a lanceolate, or rather, from its great length, of a lineari-lanceolate shape, always, as far as I have seen, very much attenuated at either end, and never, from the form of the base, in any wise deserving the name of ensiform. The margins of the leaves are slightly undulated, but quite entire: in the center of old specimens may be observed a propensity to that bullated appearance on which depends the second variety of *F. saccharinus*. The fructification is unknown. The substance, even including that of the roots and stem, is rather membranaceous than cartilaginous, and in the leaves particularly thin. The colour of the whole a pale but pleasant green. When pressed, it adheres firmly to paper.

β . differs only in its frond, instead of being linear-lanceolate, being dilated towards the summit, and sub-cuneiform; it is probably only a variety originating in accident. Mr. Mason found this at Yarmouth.



I have ventured upon quoting very few synonyms to this *Fucus*, as I cannot but suspect that it has eluded the observation of most authors, partly on account of its rarity, and partly from its near connection with the genus *Ulva*, among the individuals composing which it is probably rather entitled to a place; though, from its strong similarity to the following species, I have held it best not to separate them, at least till its fructification is discovered, or the characters of the genera of the marine *Algæ* are fixed upon a firmer basis. Mr. Stackhouse, the only writer respecting it upon whom I entirely rely, describes the stem as short, round, and horny; and the roots as fibrous, woody, and creeping; both which circumstances are so essentially different from what is observable in the plants found at Yarmouth, and so destructive of all I depend upon as its specific characters, that I cannot help entertaining a suspicion that he confounded young plants of *F. saccharinus*

with it: though some specimens that he sent me are undoubtedly the same as ours. There is indeed a very striking connection between these two species, especially when both are in an early stage of growth; and I should be sorry were any thing here urged in favour of their being distinct to be considered as being spoken with that degree of certainty which leaves no room for future recantation. I cannot too often repeat that I look upon our knowledge of these plants as still in its infancy, and consequently that whatever I urge is intended as a mere suggestion, founded indeed upon the authority of facts that have fallen under my own observation, but still intended only to stimulate others to farther inquiry. In the present instance, my great reliance is on Mr. Wigg, who has found *F. phyllitis* far more frequently than I have, and whose opinion of its claim to a place among the British Algæ as a distinct species has been confirmed by repeated examination. The compressed stem of nearly the same consistence and texture as the leaf; the thick, short, unbranching fibres of the root, and the clustered mode of growth, which has been previously pointed out by Mr. Stackhouse, appear to me to constitute its principal characters; besides which, its substance, even in old specimens, is a delicately

fine membrane, and its shape, in all that I have met with, except those of the second variety, regularly linear-lanceolate, whence in some collections it may be seen under the name of *Ulva lanceolata*. *F. saccharinus* is also sometimes both narrow and thin, but always, I believe, cartilaginous: it is therefore possible that Lightfoot's variety β , and Ray's *F. phyllitidis folio*, as well as his n. 2, above quoted, belong rather to that species. All that I have ever found of *F. phyllitis* on the Yarmouth beach, has been parasitical upon the stems of *F. vesiculosus* and *filiquosus*, in which state I never saw *F. saccharinus*, nor should I conceive it possible, from its tough, branching roots, for it to exist so. To these observations I must add that, before this latter plant has acquired the height of three inches, its stem becomes quite opaque, and different in substance from the leaf, which certainly is not the case in my specimens of *F. phyllitis*, though their length exceeds a foot. Neither the authors of "Observations upon the British Fuci," nor Gmelin, appear to have noticed this plant, as what the latter says of the thin varieties of *F. saccharinus* seems really to belong to that species.



37.—FUCUS SACCHARINUS.

F. fronde cartilagineâ simplici ensiformi stipitatâ; stipite tereti rigido.—Herb. Linn.—Buddle, p. 21.—Petiver, p. 15.—Esper, p. 52. t. 24. and p. 112. t. 56.—Gmelin, p. 194. t. 28.—Sp. Pl. p. 1630.—Linn. Transf. iii. p. 151.—Fl. Suec. p. 431.—Fl. Lapp. p. 364.—Fl. Ang. p. 578.—Fl. Scot. p. 940.—With. iv. p. 96.—Fl. Norv. i. p. 52.—Roth, Fl. Germ. iii. p. 446.

Fucus longissimo latissimo crassoque folio.—R. Syn. p. 39.

..... latissimo crassoque folio.—Moris. Hist. Ox. iii. p. 646. n. 3.

β. bullatus—fronde bullatâ, marginibus undulatis.—Buddle, p. 22.—Petiver, p. 16.—Uvedale, p. 14, 15.—Linn. Transf. iii. p. 151.—Act. Paris. 1712. p. 29. t. 3. f. 4.—Gmelin, p. 195. t. 27.—Esper, p. 113. t. 57.—Ner. Brit. p. 31. t. 9.

Ulva latissima Linn.—Syst. Nat. p. 719.

Fucus latissimus et longissimus, oris crispis.—

R. Syn. p. 39.—Morif. Hist. Ox. iii. p. 646.
n. 3.

Fucus folio singulari longissimo, in medio rugoso.

—Morif. Hist. Ox. iii. p. 646. n. 2.

..... folio singulari longissimo lato, in medio
rugoso, qui balteiformis dici potest.—R. Syn.
p. 39. n. 1.

γ . fronde oblongâ sub-membranaceâ acuminatâ.

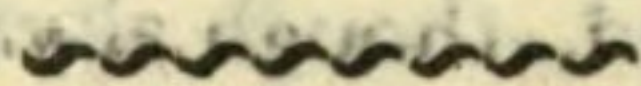
Ulva longissima.—Fl. Norv. ii. p. 128. t. 7.

δ . fronde latâ; latitudine longitudinem sub-
æquante.

Ulva maxima.—Fl. Norv. ii. p. 127. t. 7.

α is abundant on the eastern shores of England,
and β is equally so on the southern and west-
ern: γ was found at Dover by Mr. Dillwyn;
 δ at Yarmouth by Mr. Mafon.

Perennial.



The root of this Fucus is composed of nume-
rous cylindrical, hard, branching fibres, diverging
from the bottom of the stem in an horizontal and
radiated direction, but almost immediately turning
downwards, and becoming suddenly incurved;
their ends adhering most firmly, though without
suffering on that account any dilatation, to shells

or other marine bodies. From the center of these issues a * single frond, extending to six feet and often much more, in length; rising with a cylindrical, stiff, solid stipes, of which the form and size vary according to the age of the specimen, as in young plants it is not above half an inch long, nor thicker than packthread, while in old ones it is a foot long, and in circumference not less than a large swan's quill: the roundness of this is continued throughout; and, instead of losing itself gradually, as in the preceding species, it suddenly expands into an ensiform, linear, or elliptic leaf, from one to five feet long, and from two to four inches wide; the base whereof is in general slightly cordate, but varies occasionally, through all the intermediate gradations, to lanceolate, and the summits are equally subject to variation, from acute to rounded. The margin of this leaf is slightly undulated, though always entire. Sometimes, at a greater or less distance from the base,

* The plant often grows in clusters of four or five together, but still each is, properly speaking, solitary, and the fibres of the roots, though entangled, are never common to all, nor connected together.

the frond, instead of continuing as usual nearly linear, suffers a singular contraction in its width, after which it shoots out again, and recovers its former size and shape. In the center of old plants is often observable a dark-brown, cloudy appearance, which either continues in an unbroken line of various width from the beginning to the end of the leaf, or appears composed of several irregular, longitudinal streaks: in substance it is thicker than the rest of the frond, and is covered with a slimy, glutinous, green mucus, among which there can be little doubt but the fructification will hereafter be discovered. The whole is cartilaginous, but of very various thickness, occasionally approaching to coriaceous, and occasionally to membranous; yet, even in this state, though often extremely thin, it will not from pressure adhere to paper. The colour is a tawny green, more or less diaphanous; that of the stem more pale in old plants; often almost black in younger ones; always quite opaque.

In β the leaves are more waved at their margins; and their centers, even in an early stage, are wrinkled into roundish sinuses, which generally run longitudinally from base to summit, in two parallel lines, leaving a narrow, flat part between them, like a midrib; sometimes they form only

one line, and sometimes they are scattered without regularity.

γ differs only in the leaf being acuminate and almost mucronate.

δ has its leaf nearly orbicular, or rather widely cuneiform, with a rounded end.

~~~~~  
There are two very singular circumstances attending this Fucus, upon which I must be excused if I treat somewhat more diffusely than usual, as there is no other British species in which they are also observable; and I feel a strong conviction that a careful attention to them may be of considerable use in any future enquiry into the physiology of these curious vegetables. The circumstances to which I allude are the contraction of the frond, and the bullated appearance whereon depends the second variety. The former of these attracted my attention in the month of February 1799, when all the specimens found upon the Yarmouth beach had their lower leaves contracted at about two inches from the base, in such a manner that the lower part was completely pyriform, after which the frond suddenly dilated into its usual width, and continued nearly linear to the summit. This appearance was then quite new, not only to Mr.



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Wigg and myself, but equally so to all the botanists to whom I communicated it. The next spring Mr. Dillwyn observed it also at Dover; and, having continued to watch it for the whole summer, communicated to me the following result of his observations. "In March 1800, I remarked that all the specimens of *F. saccharinus*, met with on the rocks about Dover, where the plant grows abundantly, had a contraction in the frond, that in some approached much nearer the base than in others. The part above it was flat at the margins, and universally more stiff and horny than that beneath, which always appeared much younger, and waved at the edges. The distance of the contraction from the stem gradually increased, and in June I found a great number of old plants, lying among the rejectamenta, in which it was but little removed from the apex, and the small part above it was not only universally horny, but decayed, and in some measure torn off by the action of the waves, while that beneath seemed to have just arrived at its highest perfection. In August, those on the rocks were all young plants, among which I could not observe a single contraction, nor did I ever see one in any, where the upper part had not fructified. From the above circumstances I was led to suppose that the frond, after having



reached maturity, was gradually supplanted by a new one, which, bearing away the former at its apex, thus formed the annual growth of the plant." To these remarks I have little to add, except that they fully correspond with what I also have seen, and afford interesting matter for future inquiry, by opening an entirely new field for investigation; since nothing similar, as far as my knowledge extends, was ever supposed to exist, either among the marine Algæ, or any other branch of the vegetable kingdom. In a specimen now before me, the contraction is above twenty inches removed from the stem. The bullated appearance of some individuals of *F. saccharinus* is no less deserving attention, and certainly neither depends upon any accidental cause, nor is essentially necessary to the fructification: the plant not being found in this state at Yarmouth, though it is both abundant there, and produces what is supposed to be its fruit. On the other hand, it is evident from the *Nereis Britannica*, that the appearance so common with us is equally unknown in Cornwall, Mr. Stackhouse never having seen it, and being inclined to look upon Gmelin's t. 28, which unquestionably represents it, rather as a variety of *F. digitatus*. The wrinkled sinuses are observable in plants at a very early stage of growth,



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and, from the regularity with which they are in general disposed, must be considered of importance to the physiology of the species; but the specimens I am in the habit of seeing fresh being destitute of them, must be my apology for offering no conjecture as to their use, and for only endeavouring to call the attention of other botanists to them. If a leaf of this Fucus, though perfectly flat, be kept some time in fresh water, or put into the fire, tumours may be seen in various parts of it, from the air and water forcing a passage between the two coats, of which it is composed; but these swellings are similar to those mentioned under *F. ferratus*; and I only notice them here, that it may not be supposed the bullated appearance by any means depends upon them. I have said above that I have little doubt of the fruit being hereafter discovered in the thick, slimy, green mucus that often covers the central part of the leaf in perfect plants, and exudes through the epidermis without any aperture visible to the naked eye. If examined under a good microscope, it will be seen that this mucus is composed of a colourless, parenchymous matter, full of green, capillary tubes, anastomosing into large irregular meshes. I have frequently examined it, but never had the good fortune to detect any seeds. A thin horizontal slice of the stem,



subjected to a good glass, clearly proves the existence of longitudinal vessels, and of something similar to the medulla of phænogamous plants. For the difference of this *Fucus* from the two between which it is placed, I must refer to those species. *Fucus saccharinus* derives its name from the circumstance of its leaves, after they are dried, if not sufficiently washed and kept from the air, being often covered with a whitish efflorescence, similar in appearance to sugar, and which, if slightly applied, leaves upon the palate a sweetish taste; but, as Gmelin has remarked, is certainly nothing more than salt, and, if taken in too great a quantity, has the effect of irritating the bowels. The same author has observed, on the authority of Pallas, that in some parts of the sea-coasts of England it is cooked and eaten as a pot-herb; and that the inhabitants of Iceland boil it in milk, and make it into a pottage; or steep it in fresh water, expose it in a dry sunny place till it is hard, then put it up in wooden vessels, till in time it acquires a white colour, and is as sweet as sugar, when they eat it with butter. What is preserved under the name of this plant in the Linnæan Herbarium, seems to be nothing more than a fragment of one of the segments of *F. digitatus*; but there is a specimen of it in its bullated appearance among the



Ulvæ, marked U. latissima, on which authority, and that of the description in the Systema Naturæ, I have referred, among the synonyms, to that doubtful plant, the cause of so much confusion. Roth's variety  $\beta$ , called by him longipes, figured in Esper t. 24. f. 3. is certainly accidental; nor would I lay any stress upon the constancy of the  $\gamma$  and  $\delta$  of this work; but I nevertheless thought it best to introduce them, for the sake of referring to Bishop Gunner's figures in the Flora Norvegica.

### 38.—FUCUS DIGITATUS.

*F.* fronde cartilagineâ palmatâ stipitatâ; laciniis ensiformibus; stipite tereti; radice fibrosâ.—Buddle, p. 24. n. 1.—Petiver, p. 18. n. 1, 2.—Linn. Mant. p. 134.—Fl. Dan. t. 392.—Ner. Brit. p. 5. t. 3.—Esper, p. 99. t. 48, 49. (excl. syn. Gmel.)—Fl. Ang. p. 579.—Fl. Scot. p. 935.—With. iv. p. 98.—Roth, Fl. Germ. iii. p. 447.—Linn. Transf. iii. p. 152.—Fl. Fr. i. p. 97.—Fl. Lapp. p. 365.



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*Fucus hyperboreus*.—Fl. Norv. i. p. 34. t. 3.  
..... *arboreus polyschides edulis*.—Parkinson,  
p. 1292. f. 5. 2.—R. Syn. p. 46. n. 31.—  
Moris. Hist. Ox. p. 647. n. 6.

On the shores of Scotland, and the southern parts  
of England.

Perennial.

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Root, as in the preceding species, composed of several radiated, rigid, almost horny, branching fibres, concave on their upper, and channelled in their lower, surface; at first horizontal, but soon bending downwards, and with their incurved numerous ends so closely embracing the rocks on which they grow, that in a large plant the strength of a man is not sufficient to tear them up. From these arises a solitary stipes, two feet or more in height, and in thickness varying from the size of a little finger, to that of a common walking-stick, cylindrical throughout, except immediately joining its apex, where it suddenly dilates into a flat, roundish, or fan-shaped leaf, generally about a foot wide, and four or five long, irregularly divided into numerous ensiform segments, the summits of which are very acute, but seldom found perfect.

The number of these, and their relative size is uncertain, a plant being sometimes cleft into eight or twelve of them; sometimes into not more than two or three. The width also of some equals two inches, while that of others hardly exceeds the same number of lines. In general they are simple, but occasionally once or even twice divided into segments also ensiform. They are all destitute in their disks of any appearance of vein or nerve, and in their margins of any proliferous tendency. The form of the base of the frond is subject to much variation from lanceolate to reniform, but is most commonly found in an intermediate state. The substance of the leaf of this *Fucus* in young plants is thin, but cartilaginous; in full-grown specimens almost, if not entirely, coriaceous: the stem, though flexible, is nearly ligneous. The colour of the whole a sub-opaque greenish brown, which, after exposure to the sun, changes to white.

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Mr. Stackhouse, who finds this *Fucus* most abundantly among the rocks of Cornwall, has been so obliging as to favor me with two specimens, one of which has its frond bullated, in a manner somewhat similar to the 2nd variety of



*F. saccharinus*; while in the other the whole surface is at intervals plentifully spotted with what appear to be small, reddish grains, or seeds, immersed in its substance, and is covered with the same sort of slimy mucus already mentioned under the preceding species. The powers of my glass not enabling me to say that either of these is really in fruit, I have declined mentioning them in the description of the species, and only now introduce them to excite the attention of other botanists, whose opportunities are more favourable to such investigation. Another very extraordinary individual, for which I am indebted to the same gentleman, has the tips of the segments connected together, and then suddenly expands into a new frond, similar in every respect, except its want of a stem, to that beneath it. This, if often met with, seems to strengthen Mr. Dillwyn's opinion of the use of the contraction observable in *F. saccharinus*, with which species the present is so closely connected, that the drawing a line of separation between them is a matter of more difficulty than can easily be imagined by those who have seen only single specimens. In their earliest stages there seems no difference whatever between them; and, though the constancy of the laciniae in *F. digitatus* certainly affords room for the belief that



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they are natural to the frond, yet the irregularity of their formation, and the torn appearance of their margins make that supposition liable to much doubt. If they, however, are not to be depended upon, I fear it will be difficult to establish any new specific character less liable to objection; for, both in root, stem, habit, structure, colour, and appearance, the two plants have an extreme resemblance to each other. *F. digitatus* is hardly less allied to the following species; but here, fortunately, the difference of the stipes at once affords a sure and ready criterion for separation. Many authors have, nevertheless, confounded them, and in this number is to be included the acute Gmelin, who otherwise surely never would have omitted so common a species as the present, which he seems to have done, unless it is admitted that he blended it with his *F. palmatus*, or that the mere stem figured in his t. 31. f. 1. under the name of *F. polyphyllus*, was designed to represent a battered fragment of it. The varieties of this *Fucus*, depending upon the number, form, &c. of the segments, are almost infinite; but not of such a nature as to deserve particular mention: one of them now before me, gathered at Portsmouth, is very remarkable from having a leaf, which, though above four feet long, is only divided near the base into two repeatedly



dichotomous segments. \* Bishop Gunner has, in the place above referred to, given an excellent account of *F. digitatus*; in which he says, that in Nordland the stems and fronds of young specimens are boiled and given to cattle, and that the former are sometimes, also, eaten by men; that the dried stalks, in Lofoten and Vesteraalen, are employed for fuel; and, in a putrid state, used, as in this island, to manure the fields.

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### 39.—FUCUS BULBOSUS.

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*F. fronde palmatâ, laciniis ensiformibus; stipite plano, marginibus internè undulatis: radice inflato-bulbosâ exasperatâ.*—*Act. Paris.* 1712. p. 21. t. 1. f. 1.—*Fl. Ang.* p. 579.—*Linn. Transf.* iii. p. 153.  
*Fucus polyschides.*—*Fl. Scot.* p. 936.—*With.* iv. p. 97.—*Ner. Brit.* p. 6. t. 4.

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\* This author also says of it, “*Bacchantes caulibus loco fustium utuntur; et sagis, ut fabula habet, mari inequantibus et algis undique vestitis olim iidem caules thyrsi loco inserviebant.*”



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*Fucus palmatus*.—Gmelin, p. 202. t. 30. (sed non omnia synonymia.)

On the rocky coasts of the Isle of Portland and Cornwall—Scotland, Lightfoot.

Perennial,

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Root roundish, hollow, swollen into an irregular, bulb-like form, four inches or more in diameter, so as to equal in size a common turnip; rough on the outside with numerous, short, thick, divaricated fibres, or radicles, which give it an echinated appearance, and of which the ends, slightly dilating, serve to fasten the plant firmly to the rocks, &c. among which it grows. From this arises generally one, but sometimes two, or even three stems, a foot or more long, flat, solid, and much thicker than the leaf; once twisted immediately at their base, where they are nearly as wide as the root, and have their margins thin, undulated, and furbelowed. At a little distance they become quite even and linear, and in width seldom exceed a single inch: at their summit they suddenly dilate into a flat, roundish, or ovate frond, from six to twelve feet long, and one or two wide, cleft in a palmate manner into from six to thirty ensiform, or acinaciform, sharp segments,

of irregular size, generally simple, but sometimes again and again divided in a similar manner; their margins quite entire. The surface is throughout so smooth as to appear varnished, and is destitute of veins or nerve. The substance coriaceous; the colour a dark, opaque, reddish, or greenish brown, which turns black when dry. The fructification, from analogy, may be supposed to resemble that of the two preceding species.



The size of this *Fucus* is sometimes so immensely great, that the author of the *Flora Scotica* has observed, a single plant is a sufficient load for a man's shoulders. In this respect it yields to no one of the British List, and even surpasses the preceding species, so that it well deserves the appellations of *F. giganteus* and *arboreus*, which preceding authors have bestowed upon it. The singularity of its root, the flatness of its stem, the twisted manner in which it rises, and its furbelowed margin, are circumstances too characteristic to leave any doubt of its being perfectly distinct, although many modern authors, and all the older ones, appear to have confounded it with *F. digitatus*, which in other respects it closely resembles; and, together with that plant, and *F.*

faccharinus, forms in the midst of the genus a separate as well as natural family. I would wish to suggest, for the observation of those botanists who live near the rocks where the present Fucus grows, whether the radicles or fibres by which it attaches itself, do not in their use as well as appearance resemble what Pennant calls the tentacula of the Asterias, and enable it to fix itself in the same manner. Mr. Sowerby and myself found at Portland Island in June 1799, young specimens of *F. bulbosus*, of so thin a substance as to be quite membranous, and nearly allied to the *Ulvæ*: their surfaces irregularly dotted with what appeared to be mucifluous punctures, and their whole habit so unlike the general appearance of the plant, that I cannot help suspecting it was something of the same kind, which was gathered by Pallas near Landguard Fort, and from its singularity induced Gmelin to form it into a new species, under the name of * *F. bicornis*. The *F.*

* Most probably the *F. bifurcatus* of Gunner, Fl. Norv. i. p. 96, is the same thing: but his description is so short, that, without an opportunity of consulting his figure in the *Acta Nidrosensia*, it would be wrong to hazard more than a conjecture on the subject.

bifidus, also, of that author seems to belong to the same tribe.

40.—FUCUS RUBENS.

F. fronde sub-membranaceâ dichotomâ catenato-proliferâ; ramis ellipticis; ramulis apice dilatis bifidis.—Herb. Linn.—Buddle, p. 26. n. 5. and p. 27. n. 5.—Sp. Pl. p. 1630.—Linn. Transf. iii. p. 165.

Fucus crispus.—Fl. Ang. p. 580.

..... prolifer.—Fl. Scot. p. 949. t. 30.—With. iv. p. 105.

..... laciniatus.—Gmelin, p. 182. t. 22. f. 2. (excl. syn. Hudf.)

..... epiphyllus.—Fl. Dan. t. 708.

..... miniatus.—Fl. Dan. t. 769.?

..... membranaceus purpureus variè ramosus.—R. Syn. p. 47. n. 36.

..... marinus foliis crispis subrotundis in summitate bifidis.—Moris. Hist. Ox. iii. p. 646. n. 3.?

Epatica spirale.—Ginanni, p. 26. t. 26. n. 61.

Not uncommon upon the shores of Great Britain,
Perennial.

Root solid, expanded, thin, but very hard ; producing a great number of fronds, which rise with stems at first cylindrical, not thicker than thread, at the distance of a few lines either bifid or expanding singly into a narrow leaf, which also is either simple and elliptic, or dilated towards the end and forked ; in either case exhibiting in the center, especially when the plant is fully grown, some faint appearance of a midrib, thicker and darker than the rest of the frond. The surface of this leaf, in general near the edges, but seldom, if ever, exactly at them, produces sometimes one, sometimes many others, similar to itself, and in their turns also proliforous in the same manner ; repeatedly following this mode of growth, so as to give the plant much of a concatenated appearance, not unlike that of *Cactus opuntia*. The extreme branches are either entire and rounded in their terminations, or, as more frequently happens, dilated and bifid : generally instances of both may be found on the same frond ; and, in the latter case, the angles are occasionally acute with the segments sharp, occasionally blunt with the seg-

ments rounded. The proliferous leaves in their earliest stage are orbicular, and closely adpressed to the frond, with dark-purple spots at their base, among which it is possible the seeds may hereafter be found. Besides these, and quite independent of them, are sometimes to be observed what Lightfoot and other botanists have considered the fructification, which are spherical warts, not so large as a small pin's head, of a pale pink colour, scattered without order on the extreme parts of the frond, and appearing, when magnified, like young leaves, variously curled and twisted. In Britain, this plant seldom exceeds, or equals six inches in height; but in the Mediterranean it rises to double that size: the usual width of the branches is hardly more than a quarter of an inch. The habit is frequently much curled; the substance thin, but tough, and approaching to cartilaginous; the colour a very dull and opaque, though pale red, sometimes however brighter, and partaking of a crimson tint: in decay it turns to a light, dirty brown. Hardly any species is more infested, not only with the *Flustra pilosa* and other corallines, but with the smaller *Fuci*; as *coccineus*, &c. and even *Conferva verticillata* may sometimes be found growing upon it.



By the preceding description it appears that this *Fucus* affects two very different modes of growth, both almost equally common, and both for the most part observable in the numerous branches of a single specimen. Sometimes, however, they are confined to separate individuals, and it occasionally, though rarely, happens that a plant, especially in an early stage, may be found altogether destitute of the proliferous tendency, in which state it appears to be the *F. miniatus* of the *Flora Danica*, a synonym that I have, nevertheless, quoted with a mark of doubt, as its most common appearance was previously and well figured in the same work, with the apposite title of *F. epiphyllus*. Dr. Goodenough and Mr. Woodward first ascertained that the present was the *F. rubens* of the *Species Plantarum*, from the inspection of the Linnæan Herbarium; in which, under that name, are preserved four specimens; three whereof, pinned together, all belong to this plant, and a fourth by itself is *F. palmatus*. It deserves, however, to be remarked, and it has been so in a former part of this work, that the description given by Linnæus by no means well accords with either; and that it is possible the plant which he really intended, was the same as the *F. rubens* of Hudson and Lightfoot. Gmelin's

figure, above quoted, is so bad, that nothing worse can well be imagined: he has erred also in supposing it the *F. laciniatus* of the *Flora Anglica*; but his account of it on the other hand, as often happens in the *Historia Fucorum*, is very characteristic, and can hardly be mistaken. If the reference above made to Morison be accurate, as from his character it appears to be, it must be clear to any botanist who will take the trouble of consulting him, that this species was by no means well understood among the older writers. Mr. Lightfoot, therefore, deserves the credit of being the first who, by an excellent figure as well as description, removed it beyond the possibility of doubt; and from his account of it, some parts of what is said above have been borrowed. It is impossible not to regret the necessity of discontinuing the name that he gave it, which is taken from its most striking peculiarity, a circumstance in itself quite sufficient to distinguish it at first sight from all the other British Fuci. Besides this proliferous mode of growth, *F. rubens* is remarkable for producing on the disk of its frond two distinct kinds of processes, in neither of which any seeds have hitherto been discovered. What Lightfoot has figured and called warts appear so clearly under the microscope to be the rudiments

of young leaves, that, if they have any connection with the propagation of the species, it can hardly be, except by falling off and producing new plants, like the bulbs mixed with the flowers in some kinds of *Allia*. The other, which alone Gmelin appears to have observed, and not inaptly calls *Peltæ*, bear a still closer resemblance to the beginning of leaves, but are remarkable for being attached by their centers, and having in that part a dark purple spot, so that I cannot help in this instance differing from preceding authors, by indulging the supposition that it is in these the seeds are most probably to be sought; and that, having performed the office of pods, they afterwards, as in many other *Fuci*, lengthen into new branches. The faint appearance of a midrib is also deserving of notice in this plant, and brings it near to *F. dentatus*; its closest affinity is, however, with the following species; but from that and all others it is in its habit and ramification so different that, now it is once well known, there is little fear of its being hereafter mistaken.

41.—FUCUS NORVEGICUS.

F. fronde cartilagineâ dichotomâ; ramis linearibus integris, apice rotundatis: tuberculis hemisphæricis disco insidentibus.—Fl. Norv. ii. p. 122. t. 3. f. 4.

Fucus crenulatus β .—Linn. Transf. vi. p.

At Dover, Mr. Dillwyn.

Perennial?—August—September.

Root a thin, expanded disk, common to numerous fronds, from three to six inches high; which rise at first with very short, cylindrical stems, hardly thicker than large thread, generally simple, but sometimes bifid; at the distance of two or three lines from the root becoming compressed, and gradually losing themselves in flat branches, about two lines wide, of the same substance throughout, smooth, altogether destitute of any appearance of either midrib or veins, repeatedly dichotomous at irregular distances with roundish angles, quite linear, and having their margins perfectly entire. The extremities are bifid, with seg-

ments between patent and divaricated; their apices blunt and rounded. The fructification consists of hemispherical tubercles, about the size of turnip-seed, plentifully scattered over either surface of the upper branches; at first of a dark colour, and apparently covered with the epidermis, through which they, in maturity, seem to exude, and adhere to the outside of the frond, in the form of small, whitish, or flesh-coloured warts, full of very minute seeds. This plant is never proliferous; its habit is much twisted in a sub-spiral manner; its substance is cartilaginous, and in the older branches inclining to coriaceous; its colour a deep, rich, brownish red, sometimes tinged with crimson; and a fine pale pink in the young shoots: if kept in fresh water it turns to a dull dirty yellow.

It was unluckily not till several months after I had sent to the Linnæan Society the account of *F. crenulatus*, and described the present as a variety of it, that I was fortunate enough to procure a copy of Bishop Gunner's *Flora Norvegica*, in the second volume of which I was immediately struck with a figure of this *Fucus*, not indeed well executed, but still sufficiently characteristic

to leave no doubt of the plant he intended to represent. It was impossible for me not to regret what had been done; but at the same time, as it had always appeared to me somewhat doubtful, whether this plant and *F. crenulatus* were not in reality distinct, I shall in this work consider them as such, resting the specific difference upon the entire edges, divaricated dichotomies, rounded apices, and cartilaginous substance of the one, opposed to the minutely crenulated margins, acute angles, lineari-lanceolate terminations, and thicker, coriaceous texture of the other: at the same time observing that, though it appears best for the present to regard them in this light, I cannot consider the point certain till a fresh supply of specimens from Portugal enables me again to examine the *F. crenulatus* in a recent state. Considered as to its connection with the British Species, *F. norvegicus* holds an intermediate place between *F. rubens* and *crispus*, agreeing in texture and substance with the latter, but in general habit with the former. It is, however, sufficiently distinct from either, and may immediately be known from every varying appearance of *F. rubens* by its thicker substance, its regularly dichotomous mode of ramification, its being destitute of all proliferous tendency, its want of any appearance of a midrib,

and its darker colour. This latter circumstance, together with its smaller size, and its cylindrical stipes, affords equally prominent traits of difference from *F. crispus*; but the most ready method of separating it from both these depends on its fructification, which in maturity precisely resembles, except in shape and size, that of *F. rotundus*, and removes it far from all the other *Fuci* of the same division. Gunner, who seems to have had a very imperfect knowledge of this plant, remarks, that it resembles the Linnæan *F. divaricatus*, and expresses himself with some doubt how far it is different from it. Upon this point, however, there is no need to enlarge; and, fortunately, our knowledge of the fruit makes it equally unnecessary to spend time in controverting his opinion that it is only some known species in an early stage of growth. The British Flora is indebted to Mr. Dillwyn for being the first who discovered this *Fucus*, which he did in considerable plenty at Dover. Dr. Goodenough, also, writes me word that he has found it at Weymouth, but never in a state of perfection

42.—FUCUS CRISPUS.



F. fronde cartilagineâ dichotomâ crispo-undulatâ;
ramis dilatatis integris: tuberculis solitariis
sparsis immerfis hinc concavis.—Herb. Linn.
—Buddle, p. 10. n. 8.—Linn. Mant. p. 134.
(excl. fyn. Morif.)—Syst. Nat, p. 718.—
Linn. Transf. iii. p. 169.—With. iv. p. 106.
—Fl. Norv. ii. p. 91.

Fucus ceranoides.—Gmelin, p. 115. t. 7. f. 1.—
Fl. Ang. p. 582. α , β , δ .—Fl. Scot. p. 913.
 α , β .—Roth, Fl. Germ. iii. p. 450.—Esper.
p. 143. t. 98. f. 1, 2, 3.

..... membranaceus ceranoides variè dissectus.—
R. Syn. p. 44. n. 16.

..... membranaceus ceranoides ramosus per sicci-
tatem obsoletè virescens.—R. Syn. p. 44.
n. 17.

β . virens—membranaceus, ramis dilatatis planius-
culis, laciniis acutis longiusculis.—Petiver,
p. 20. n. 3, 4.—Linn. Transf. iii. p. 169.

γ . stellatus—sub-membranaceus, ramis dilatatis
apice in lacinias numerosissimas confertas bre-

- viusculas divisas.—Herb. Linn.—Buddle,
p. 10, n. 5, 6.—Linn. Transf. iii. p. 169.
- Fucus stellatus.—Ner. Brit. p. 53. t. 12.
- δ. æqualis—cartilagineus, ramis omnibus æqualibus linearibus planis, laciniis obtusis.—Linn. Transf. iii. p. 169.
- Fucus foliifer.—Esper, p. 106. t. 52.
- crispatus.—Fl. Dan. t. 826.
- crispus.—Ner. Brit. p. 63. t. 12.
- dichotomus membranaceus e viridi flaves-
cens, angulos rotundiusculos efformans.—
Moris. Hist. Ox. iii. p. 646. s. 15. t. 8. f. 11.
- ε. filiformis—cartilagineus compressus, ramis sub-
linearibus planis, laciniis elongatiusculis acutis.
—Buddle, p. 9. n. 2. and p. 10. n. 1, 2, 3.
—Petiver, p. 20. n. 5.—Linn. Transf. iii.
p. 169.
- Fucus filiformis.—Fl. Ang. p. 585.
- ceranoides. var.—Gmelin, p. 115. t. 7. f. 3.
- ceranoides albidus ramulorum apicibus stel-
latis.—R. Syn. p. 44. n. 18.
- ζ. patens—sub-cartilagineus: fronde lineari hinc
canaliculatâ; dichotomiis patentibus.
- Fucus patens.—Linn. Transf. iii. p. 173.
- η. lacerus—cartilagineus compressus: apicibus
angustissimis elongatis ramosis.
- Fucus lacerus.—Ner. Brit. p. 50. t. 11.

♀. *farniensis*—coriaceo-cartilagineus: ramis hinc sub-canaliculatis dilatatis apice rotundatis emarginatis.

♂. *planus*—sub-coriaceus planus: fronde latâ; ramis linearibus apice obtusis.

α and γ are found on most parts of the British coast: the other varieties are chiefly confined to the shores of Dorsetshire, Devonshire, and Cornwall; except ♀, which abounds at the Island of Guernsey.

Perennial.—October—May.

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Root an expanded disk; fronds numerous, rising from an extremely narrow point, but immediately dilating, and, at the distance of an inch or less, divided in a dichotomous manner, with bluntish angles; then continuing with numerous, similar dichotomies, at extremely short distances, and with branches almost linear, but dilated upwards, to the summits, which are cleft into so many segments, that, to use Gmelin's expression, "taken collectively, they resemble a Corymbus." Each segment is bifid at the end, in a manner between patent and divaricated, its lobes generally short and obtuse, but often longer and more acute: sometimes so much elongated, that they are twice



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or thrice divided: the length of the fronds is seldom more than three inches, their breadth often nearly one; their whole habit, when fresh, remarkably curled, especially at the extremities: through all their ramifications they are flat, or with only a faint tendency to become channelled, never regularly so, as in *F. mammillofus*: their margins are entire, but often proliferous. The fructification of this plant, which is constant through all its varying appearances, and in which its principal character must rest, consists of roundish, solitary tubercles, immersed in the substance of the frond, and generally placed towards the upper segments, often six or seven in each, concave on one side, and greatly convex on the other; varying in colour from pale-red, which is their most frequent hue, to deep brown, indeed almost black; full of very minute, dark seeds, and, when falling out, leaving cavities in the middle of the plant. The substance of *F. crispus* is thin, but cartilaginous, horny when dry; its colour a rich, dark-brown, semi-transparent: black after it is dried, except when exposed to a strong light; changing in decay to a bright green, and from exposure to the sun becoming white.

$\beta$  is most frequently of a greenish colour; has the extremities of its branches between curled



and undulated; the laciniae rather long, and somewhat acute.

$\gamma$  has its frond flat, and so thin as to appear membranaceous; is often still more dilated than  $\alpha$ , but, instead of widening immediately, does it very gradually: it continues to a considerable distance from the root simple, and then is not more than twice or thrice dichotomous: its extremities are divided into an immense profusion of extremely short, bluntish segments. Its colour is a pale greenish brown. Its length hardly two inches.

$\delta$  is cartilaginous and compressed; rises with an undivided stem, generally to the height of three inches, before it branches, is then frequently dichotomous with segments every where linear, hardly the sixth part of an inch wide: the extremities are numerous and bluntish. Its height often exceeds seven inches: its colour is a reddish brown, turning in decay to a beautiful green, or pale pink.

The frond of  $\epsilon$  in my specimen is nearly a foot long, cartilaginous, and but slightly compressed, still more narrow than the preceding, which it much resembles in its mode of growth: its branches are all linear, the angles of its dichotomies acute; its summits forked with segments



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almost an inch long, terminating in sharp points : its colour a reddish brown, which quickly changes to white.

ζ is remarkable for its channelled stem, which brings it very near to the following species ; but its fruit is the same as that of all the other varieties of *F. crispus*. In habit, size, and mode of growth it resembles δ, except that the angles of the dichotomies are more regularly patent : its substance also is less cartilaginous.

η differs from all the preceding varieties in preserving an almost linear frond, two or three lines wide, till it reaches its extremities, where it becomes suddenly cleft into numerous, very narrow segments, so slightly compressed that they are almost cylindrical : the length of these often exceeds half an inch, and they are generally twice or thrice dichotomous. Its colour is a greenish brown ; its substance cartilaginous.

θ, which was sent me by a friend from the Isle of Guernsey, has by far the greatest claim to beauty of all the appearances of *F. crispus*. Its colour is a deep rich chesnut, paler towards the extremities, and there tinged with pink. Its length is about four inches, its greatest width the quarter of one : it expands very gradually, rises to nearly half its height with an undivided, compressed



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stem, then becomes dichotomous with slightly-channelled branches, that, continuing to widen and increase in number, form the segment of a circle. Its summits are short, blunt, sub-palmate, and emarginate. Its habit curled; its substance cartilaginous, but approaching to coriaceous.

It rises with a stem broad even at the base, and divided into several still broader segments, very little curled or undulated, sometimes reaching at the dichotomies above an inch in width. The summits are short and round; the substance thick and coriaceous; colour a very dark, dull brown, which in decay acquires a reddish tinge: its height is about six inches.



Dr. Goodenough and Mr. Woodward employed great pains in endeavouring to ascertain the principal varieties of this marine Proteus, which, in point of different appearances, exceeds even *F. vesiculosus*, and every other species hitherto discovered. The success attending the researches of those gentlemen has been so great, that it seems impossible to do better than tread in their footsteps; and I have consequently done so with regard to the five first varieties; for the second of which indeed I entirely rely upon them. Of the



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remaining four, enumerated in this work, three had either escaped their observation, or been regarded by them too insignificant to require particular notice: the fourth (*patens*) they have admitted as a separate species, but its claim to such a distinction resting almost entirely on its channelled frond, a strong tendency to which is observable in some of the others, and in most of them after they are dried, unless they are subjected to great pressure, I cannot but at present differ from them on that point, and consider it as nothing more than a variety of *crispus*, though I readily allow it to be a very singular one. I have also laid aside the division "*fronde hinc canaliculatâ*," not because, as many botanists say, it is not founded in nature, for I am convinced it is, and no error can be greater than that of those who look upon it as having no existence among the plants when recent, and depending only upon the drying them, but because, as a want of care in this latter circumstance gives the same appearance, and as nine botanists in every ten judge of *Fuci* only from Herbaria, I considered it likely to be the cause of confusion, rather than of elucidation. The several varieties that are above described, struck me as the most worthy of being pointed out, and as affording the best series of gradations from its broad and flat,



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to its narrow and barely compressed state : to have endeavoured to do more would have been almost, if not altogether, an endless task ; it would have been, in the language of Juvenal, like enumerating “quot amaverit Hippia mœchos” : even of these indeed there is some difficulty in determining the proper limits ; for the steps by which this Fucus passes from one extreme to the other are so gradual, that the remark is strictly correct which has been already applied to it, that “usque adeo quod tangit idem est.” If any of the appearances be really distinct species, I must own I should suppose it to be Hudson’s *F. filiformis*, an authentic specimen of which, from the author of the *Flora Anglica* himself, has been communicated to me by Rev. H. Davies, so that there can no longer be any difficulty in determining this hitherto doubtful plant. In this there is one peculiarity that it would be wrong to pass over unnoticed ; it is that the seeds, after the decay of the capsules, adhere to the surface of the frond, which does not appear to be the case in any other variety. Its habit is so dissimilar to that of all the remaining appearances of *F. crispus*, that, when Mr. Sowerby and myself found it lying on the sandy beach at Lyme Regis, in June 1799, we were unable to tell, till we had picked it up, whether what we



saw was more than an unusually thick specimen of *F. lumbricalis* in fruit; a deception, which, as we remarked at the time, we should have been unwilling to have believed possible, on the faith of weaker evidence than that of our own eyes. At the same place we met with another variety, not enumerated here, because we could not say whether it did not originate in accident, the tubercles of which were all black, and placed immediately at the extremities. On the rocks of Falmouth we found the true *F. crispus*, and were forcibly struck with the bright prismatic hues that beamed from its frond, even after it was taken out of the sea, and which became again conspicuous when, after the expiration of above two years, some of the specimens were immersed in fresh water. The confusion of synonyms, and the lengths to which authors will go when they have once made up their minds upon a subject are no where more conspicuous than in this *Fucus*; all of them having taken for granted that it was the *F. ceratoides* of Linnæus, and, without giving themselves time to consider, brought together, as was observed in the Linnæan Transactions, "a strange mass of plants, no one agreeing with the description of the *Species Plantarum*, or consistent with its brethren." In no place has this mistake been



so remarkable as in the *Flora Anglica*, where, by a singular stretch of imagination, even *F. inflatus* is considered a variety of it. At the same time, however, it ought not to be omitted that, but for the presence of the Linnæan Herbarium, we, even if we had been fortunate enough to escape this error, should hardly have known our plant to be the *F. crispus* of the Mantissa, where the dependence seems principally placed on Morison's t. 8. f. 6. which never could have been intended to represent this species, and does not even accord with any of its varieties. Baron Wulfen's *F. ceranoides*, described in the third volume of Jacquin's *Collectanea*, and figured by Professor Esper, t. 98. f. 4. is Mr. Hudson's *F. bifidus*, as I know from specimens obligingly communicated to me by the illustrious author, since the description of that *Fucus* in the preceding part of this work has been printed. The constant character of *F. crispus* depends on the roundish tubercles, innate in the substance of the frond, concave on one side, and, when mature, deciduous, so as to leave cavities in the places that they occupied.

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## 43.—FUCUS MAMMILLOSUS.



F. fronde cartilagineâ dichotomâ hinc canaliculatâ;  
ramis dilatatis integris utrinque mammilloso-  
tuberculiferis.—Buddle, p. 10. n. 7, 9, 10.—  
Linn. Transf. iii. p. 174.

Fucus canaliculatus. var. β.—Fl. Ang. p. 583.

..... ceranoides. var. ε.—Fl. Scot. p. 916.

..... ceranoides. var. δ.—Gmelin, p. 115.

..... ceranoides.—With. iv. p. 99.

..... alveolatus.—Esper, p. 139. t. 70.

..... humilis dichotomus membranaceus cera-  
noides latioribus foliis ut plurimum verrucosis.

—Moris. Hist. Ox. iii. p. 646. s. 15. t. 8. f. 13.

β. acutus—fronde angustâ lineari, apicibus emargi-  
natis.—Linn. Transf. iii. p. 174.

F. ceranoides. var. ζ.—Fl. Scot. p. 917.

γ. stellatus—fronde disco margineque prolifera;  
ligulis numerosissimis confertis oblongis mam-  
milloso-tuberculiferis.

δ. echinatus—ramis dilatatis hinc subnudis.

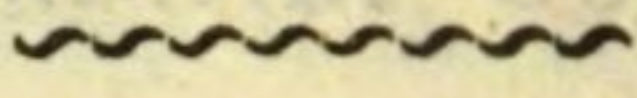
Fucus echinatus.—Ner. Brit. p. 65. t. 12.

ε. incurvatus—fronde sub-lineari apicibus rotun-  
datis; tuberculorum pedunculis incurvis.



On the southern and western coasts of England.

Perennial.



Root a flat disk; fronds very numerous, from three to six inches long, and in their upper branches about the half of one wide; rising at first with a narrow, compressed, oblong stem, which becomes bifid at the height of an inch or two, and continues with repeated dichotomies, through a series of gradually widening branches to the extremities, which are bifurcate with segments of uncertain lengths, frequently bluntish and emarginate, but sometimes acute, and occasionally elongated into very narrow, long, linear points, so as to be mucronated. The upper branches are often quite flat, but the lower ones, and part of the stem are, in their recent state, always channelled on one side, and convex on the other, in the same manner, though in a less degree, as those of *F. canaliculatus*. The edges are every where entire, though frequently proliferous with oblong shoots. Over the whole surface, and on both sides, but chiefly towards the upper branches, the plant produces a profusion of mamilliform processes, whence it derives its name. These are often so numerous as to cover the frond.



They rise in the form of subulate, sub-incurved cilia, scarcely a line long, which either swell at their summits into small, round, darkish tubercles, full of minute seeds; or, dilating and becoming dichotomous, shoot out into the rudiments of new branches. The substance is cartilaginous and strong; the colour a transparent, reddish brown, which changes to green in decay, and to white from exposure to the sun or air.

The frond of  $\beta$  is extremely narrow and linear; its mammillose processes less numerous; the tips of its branches bluntish, and so short that they can hardly be called more than emarginate: it is channelled to the very extremities, and its colour is a very dark brown.

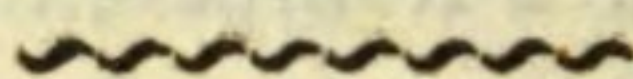
$\gamma$  differs in its smaller size, dark, purple colour, and wonderfully proliferous growth; the upper segments being entirely covered with oblong, bifid, flat shoots, out of which the mammillæ issue: in its habit and ramification it resembles the stellated variety of *F. crispus*.

$\delta$  varies in the greater dilatation of its upper branches, and the mammillæ being confined chiefly to one side: its colour, too, is often a pale green.

$\epsilon$  is a very singular variety; its colour is a light pink; stem narrow, and but slightly dilated;



summits long and rounded: the peduncles of the tubercles all grow near the top of the frond, and are all incurved. In habit and mode of growth it agrees with the variety *æqualis* of *F. crispus*, but its height does not exceed three or four inches.



The resemblance in substance, colour, habit, size, and ramification between the present and the preceding species is so extremely great, that their having been regarded as the same by those botanists who saw them only in a barren state, cannot be considered by any means wonderful, though their being looked upon in that light by such eminent men in the science as Gmelin and Lightfoot, who were even acquainted with their fructification, and had Morison's excellent figure before them, is really matter of much surprize. Mr. Hudson's referring this plant to *F. canaliculatus* is no less astonishing. We are here again indebted to Dr. Goodenough and Mr. Woodward, who, trusting to their own observation, did not hesitate to differ from the authors that preceded them, and held out a truer investigation, by observing, that "*F. mammillofus* cannot be *ceranoides* of Linnæus, or *canaliculatus*, for the ends of the branches in



both those species are full of tubercles—in this, plain. It cannot be *crispus*, because in that the frond is plain, and the tubercles are solitary, and fixed in the substance of the plant; in this the frond is always channelled, and the fructification is minute tubercles in the mammillose processes standing out on each side of the several branches.” There is no other British species with which it can be confounded, and there is consequently no necessity to enlarge farther on the subject; though it may not be amiss to observe, that specimens are occasionally to be met with, in which, besides the mammillose processes, one or two tubercles may also be detected immersed in the substance of the branches: but instances of this nature are very rare. Professor Esper’s acuteness discovered that this *Fucus*, of which he received specimens gathered by Schmidel near Naples, was distinct from any previously described; and he well remarked that its closest affinity seemed to be with *F. crispatus* Fl. Dan.; but the individuals from which he has drawn the figure in his work were not sufficiently perfect to enable him to form a just conception of the nature of the plant. All that has been previously said respecting the varieties of the preceding may, with the strictest accuracy, be applied to those of the present species, of



which, however, most probably on account of its being more rare, I have not yet seen so many, nor so strikingly different appearances. It ought to be remarked, that it does not seem, by my specimens, that reliance is implicitly to be placed on the dilated branches with acute segments, which Dr. Goodenough and Mr. Woodward point out as sufficient to separate *F. mammillosus* from *F. crispus*, even when not in a state of fructification.

#### 44.—FUCUS CANALICULATUS.

*F. fronde lineari dichotomâ integerrimâ hinc canaliculatâ fastigiatâ; apicibus bifurcis, tuberculiferis oblongis obtusis tumidis.*—Herb. Linn. —Buddle, p. 31. n. 2, 3, 9.—Micheli's Marine Plants, t. 18.—Aët. Paris. 1711. pl. 11. f. 5. radicem fructificationemque exhibet.—Fl. Dan. t. 214.—Syst. Nat. p. 716.—Gmelin, p. 73. t. 1. A. f. 2.—Fl. Scot. p. 917.—Vellay, t. 1.—With iv. p. 99.—Roth, Fl. Germ. iii. p. 451.—Linn. Transf. iii. p. 172.



*Fucus excisus*.—Sp. Pl. p. 1627.—Linn. Mant. p. 508.—Fl. Lapp. p. 366.—Fl. Fr. i. p. 96. Fl. Norv. i. p. 96.

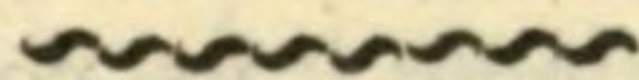
..... *rotundus*.—Esper, p. 40. t. 17. (excl. syn. Morif.)

..... *pumilus dichotomus*, segmentis ex unâ parte gibbosis, ex alterâ excavatis.—R. Syn. p. 43. n. 12. (excl. syn. Morif.)

..... *palmaris angustifolius* ad extrema vesiculis rugosis bifurcatus.—Morif. Hist. Ox. p. 647. s. 15. t. 8. f. 12.

On the southern and western parts of the British coast, not unfrequent.

Perennial.



Root an expanded disk; fronds very numerous, from two to four inches long, and hardly the eighth of one wide; of the same size from base to summit, and channelled throughout, not by a groove made in their substance, but by their margins naturally curling, and approaching each other, thus leaving the center concave on one side, and convex on the other. The ramification, which is every where dichotomous, takes place very near the root, and is continued six or seven times, at uncertain distances, to the extremities, which,



when the plant is not in fruit, are slightly emarginate, and terminate in short, obtuse segments; but, at the time of fructification, dilate, and swell into compressed, binate, or bifid pods, of a shape either oblong, or, as it often happens, approaching to cuneiform; varying from a quarter of an inch to an inch in length, full of a colourless transparent mucus, and slightly uneven in their surfaces, from the seminiferous tubercles which they contain: these are round, and lie disposed in two irregular rows; from twenty to thirty of which are in each summit, and about ten seeds in every tubercle. Their structure is precisely similar to those of *F. vesiculosus*. The branches of this *Fucus* are all of nearly the same length; its substance is cartilaginous; its colour a darker or lighter brown, often strongly tinged with yellow, especially in the fructifying summits. When dried it appears black, unless held to the light.



The channelled frond of this *Fucus*, and its swollen tuberculiferous apices, which make it a curious link, connecting two so different species as *mammillosus* and *vesiculosus*, are circumstances of so singular a nature, that there can be no fear of its being mistaken for any other, and conse-



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quently render it needless to add any observations to the preceding description, for the purpose of keeping it more certainly distinct from its congeners: were but every individual of this extensive family equally well marked, botanists would be spared a great deal of trouble. Even here, however, Linnæus has erred, not being, as Dr. Smith has remarked, aware, when he wrote the twelfth edition of his *Syst. Nat.*, that this *Fucus* was the excusus of the *Sp. Pl.*, whence it consequently occurs twice in the first-mentioned book. He afterwards perceived, and partly corrected his mistake in the second *Mantissa*. Ray, Gmelin, and Withering have all referred Morison's t. 8. f. 11. to this species, but surely without sufficient reason, for the figure much better represents the variety of *F. crispus*, under which it is quoted in this work; and there is another excellent representation of *F. canaliculatus* in the f. 12, which, by a singular mistake, is referred in Ray's *Synopsis* to one of the varieties of *F. vesiculosus*. The species figured in Professor Esper's *Icones*, t. 73, under the name of *F. canaliculatus*, is evidently very distinct from ours, and appears, from some specimens that he has been so obliging as to send me, rather to belong to one of the smaller appearances of Lightfoot's *Ulva dichotoma*. This plant



is liable to considerable variations in its size, and a specimen, for which I am indebted to Mr. Stackhouse, from the Severn, is really gigantic, but still preserves all the characteristic marks of the species; among which deserves to be noticed its possessing the same wonderfully proliferous tendency when injured, as has been previously mentioned in the account of *F. vesiculosus*.

#### 45.—FUCUS LOREUS.

*F. fronde dichotomâ lineari acutâ glabrâ undique utrinque tuberculatâ, basi pezizæformi.*—Herb. Linn.—Buddle, p. 20.—Uvedale, app. p. 87.—Aët. Gall. 1712. p. 24. pl. 1. f. 2. ubi cum floribus feminibusque depingitur.—Aët. Gall. 1772. partie 2nde. pl. 3. f. 14. y.—Syst. Nat. p. 716.—Linn. Transf. iii. p. 176.—E. B. t. 569.—Ner. Brit. p. 37. t. 10.—Fl. Dan. t. 710.—Fl. Ang. p. 583.—Fl. Scot. p. 920. With. iv. p. 96.—Roth, Fl. Germ. iii. p. 453.—Esper, p. 43. t. 19. and p. 81. t. 39.—Fl. Norv. ii. p. 125.



*Fucus elongatus*.—Sp. Pl. p. 1627. (excl. syn.

Morif.)—Gmelin, p. 103. (excl. syn. Hudf.)

*Ulva pruniformis*.—Fl. Norv. ii. p. 89. t. 2,

f. 6, 7, and t. 9. f. 4, 5.

*Fucus longo angusto crassoque folio*.—R. Syn.

p. 43. n. 11.

..... *fungis affinis*.—R. Syn. p. 43. n. 15.

..... *marinus ceranoides globulis verrucosis fig-*

*natus*.—Morif. Hist. Ox. iii. p. 648. s. 15. t. 9.

..... *marinus secundus Dodonæi*.—Parkinson,

p. 1292. t. 6, 7. (central figure.)

$\beta$ . *inæqualis*—fronde latiore inæquali, angulis di-

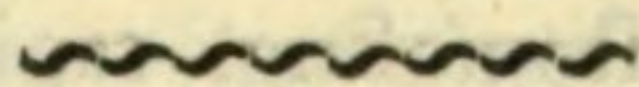
chotomiæ apicibusque obtusis.—Linn. Transf.

iii. p. 176.—Act. Gall. 1772. partie 2nde.

pl. 4. f. 18.

On the rocks in Cornwall, and the western coast  
of England; among the rejectamenta of the  
sea at Yarmouth:  $\beta$ , at Yarmouth.

Perennial.—December—January.



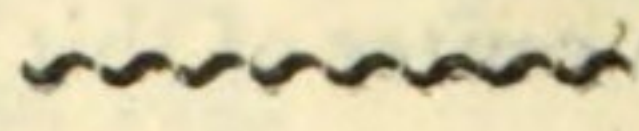
From a small, callous root arises a stipes, half  
an inch or an inch long, cylindrical at the base,  
but gradually expanding into the form of an orbi-  
cular peziza; of a tough, leathery substance, quite  
flat at the summit, and an inch or more in dia-  
meter. Out of the center of this issue one or two



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smooth, compressed fronds, which often run to the length of ten feet, preserving throughout an almost unvaried width of about five lines, and a thickness of about one; divided near the base, and continuing with a series of repeated dichotomies, four or five inches from each other, till they terminate in numerous, attenuated, and acute segments. The whole surface of the frond on either side is studded with small, round, slightly-prominent swellings, perforated in their centers, and copiously discharging a yellow mucus. If cut through horizontally, it will be seen that under these swellings lie pale, straw-coloured, oval tubercles, in which are inclosed the minute, roundish seeds, of a colour so dark as to be easily visible to the naked eye. The substance of this Fucus is coriaceous, but soft and succulent; and a thin segment exposed to a strong microscope shews it to be entirely composed of an exterior hard coat, containing a mass of parenchymous, colourless matter, full of anastomosing, capillary fibres. Its colour, in a fresh state, is a greenish brown; when dry, an entire black.

β differs in the frond, being of unequal breadth; the angles of the dichotomies obtuse, and the apices rounded.





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By far the most prominent feature of the present *Fucus* depends upon the singularity of its base, which in appearance precisely resembles some species of *peziza*; whence, among the older writers, it not unjustly acquired the name of *F. fungiformis*. There is no other, either in the British or foreign catalogue, known to possess a similar appendage; nor is the use which in the present case it is designed to answer in the œconomy of the vegetable, by any means apparent. The frond, in its very earliest stage, is provided with it, and it acquires a considerable size before its upper surface begins to shew any symptom of the branches that afterwards arise from it. Like the leaf of *F. saccharinus*, and many others, it is composed of two distinct coats, between which air or water occasionally force a passage, and it thence assumes a globular form, as was remarkably the case in several specimens gathered by Mr. Mason on the Yarmouth beach in the autumn of 1801. Some similar circumstance most probably induced the reverend author of the *Flora Norvegica* to entertain the strange idea of its being the Linnæan *Ulva pruniformis*, in which he has been followed by Professor Esper. The dispersion of the seeds over the whole surface of the frond in this species is another singularity attending it, and



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makes it, if I may be allowed an expression so figurative as to border closely upon pedantic, \* an angle in one of the polygonal meshes of the net of the vegetable world, whereby nature connects the genera of *Fucus* and *Ulva*, insensibly passing from the one to the other. Any botanist may be easily convinced of this by placing under a microscope a thin, horizontal slice of *F. loreus* and *Ulva diaphana*; in the substance and fructification of which he will find a striking similitude, though at the same time he will observe that the epidermis of the former is more coriaceous, that its seeds lie in more regular clusters, and that the mucifluous apertures, through which they escape, are wholly wanting in the latter. The specimen of Linnæus' *F. elongatus*, preserved in his Herbarium, is un-

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\* This idea, I readily grant, appears rather absurd and overstrained in English, but it is borrowed from an exquisitely beautiful one, as is expressed in the Latin of Professor Willdenow, "Alma Natura in se spectata, non est systematica, non genera habet, neque catenam rerum agnoscit. Singula creata nexu quasi retiformi, ut ita dicam, cohærent, et nos singula in lineam rectam disponere solemus."



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luckily destitute of a root; but there still seems no doubt of its being merely the present species; though, besides this deficiency, it has the peculiarity of being swollen and broken at the joints, as mentioned in the *Systema Naturæ*. It is difficult to account for Morison's figure above quoted, having been hitherto altogether overlooked, and, still more so, for the idea generally entertained of Gmelin's not having known this *Fucus*, nor mentioned it in his work; whereas he has given a long and accurate account of it under the name of *F. elongatus*, and has, moreover, quoted all the synonyms, as was first noticed by Professor Mertens, in Dr. Schrader's excellent *Botanical Journal*. *F. loreus* appears to be an inhabitant of deep waters, and in such only Mr. Sowerby and myself found it, growing on the rocks near Falmouth and St. Michael's Mount; strong easterly winds bring it occasionally to Yarmouth, in the wintry months; but that it is not a native of that part of England is clear from *F. articulatus*, *ovalis*, and *palmaris*, species never found there at any other time, being not unfrequently attached to its root. The accurate Dr. Roth seems, from his *Flora Germanica*, to have received a specimen with singular swellings at its apices, which he describes as the fruit; an error not to be wondered



at, even in a man of his penetration; though to British botanists, who possess such infinitely greater advantages in the investigation of these plants, and such opportunities of visiting them on their native rocks, it is hardly necessary to notice it.

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46.—FUCUS NODOSUS.

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*F. fronde sub-dichotomâ; foliis distichis pedunculatis subrotundis integerrimis seminiferis; vesiculis innatis solitaribus fronde latioribus.*

—Herb. Linn.—Buddle, p. 13.—Petiver,

p. 35.—Uvedale, p. 3.—Gmelin, t. 1, B. f. 1.

—Fl. Dan. t. 146.—E. B. t. 570.—Esper,

p. 25. t. 7. and p. 118. t. 60.—Reaumur, Act.

Gall. 1712. p. 26. t. 2. f. 3.—Sp. Pl. p. 1628.

—Linn. Transf. iii. p. 190.—Baster, vi. p. 121.

t. 11. f. 5.—Ner. Brit. p. 35. t. 10.—Fl. Ang.

p. 584.—Fl. Scot. p. 918.—With. iv. p. 84.

—Fl. Suec. p. 431.—Fl. Lapp. p. 366.—Fl.

Fr. i. p. 96.—Fl. Norv. i. p. 83.—Roth, Fl.

Germ. iii. p. 454.

*Fucus maritimus nodosus.*—R. Syn. p. 48. n. 41.

..... *maritimus vesiculis majoribus singularibus*



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per intervalla dispositis.—Morif. Hist. Ox. iii.

p. 647. s. 15. t. 8. f. 2.

$\beta$ . minor—foliis ovatis pedunculo vix latioribus.

$\gamma$ . filiquatus—foliis lineari-lanceolatis.

$\alpha$  is common on all parts of the British coast;  $\beta$  was gathered at Portsmouth;  $\gamma$  at Dover, by Mr. Dillwyn.

Perennial—November—April.

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From a small, thick, scarcely dilated base of irregular shape, rise several fronds, which run to the length of six feet or more, bearing at first the form of flat, oblong leaves, dichotomous at the distance of about an inch from the root, and soon growing into compressed, smooth stems, about a quarter of an inch wide, and almost linear throughout, except that at irregular intervals they swell into oblong, or elliptical, hollow vesicles, always solitary, much broader than the rest of the frond, and in size varying from that of a hazel nut, to that of a * walnut; their coats thick, and

* Mr. Stackhouse mentions that in old plants they are sometimes four inches long; a size far exceeding that of any I ever saw.

so tough that pressure between the fingers is not sufficient to break them; and their inside lined with a few capillary fibres, which give it a hairy appearance. The ramification of the stem seldom exceeds two or three dichotomous divisions, besides which it is occasionally provided with a few irregular side branches: the summits almost always end in small vesicles: from its edges, in a distichous manner, not beginning till some distance from the root, grows a greater or smaller quantity of leaf-like pods, placed without any certain order, sometimes oppositely, sometimes alternately, and sometimes two, three, or four from the same point: they are supported upon peduncles half an inch or more long, slightly compressed, and very narrow at their insertion, but gradually dilating; their form is generally roundish, but occasionally oval or oblong; their size variable from that of a pea, to that of an acorn: they are turgid with the mucus with which they are filled, and their exterior surface is faintly tubercled, from the seeds that they contain, which lie in small, dark-coloured, globular clusters, immediately under perforations in the frond, so minute as to be hardly visible. This Fucus exceeds almost every other in its tough, coriaceous substance. Its colour is an olive green, which changes, after it is dried, to

black : the stalks are generally more or less covered with *Conferva polymorpha*, which I never saw upon any other species.

β is a remarkably pretty variety, much more narrow than the plant is usually found : the pods very small, of an oval form, scarcely more dilated than the peduncles which support them.

In γ the pods are an inch or more long, and hardly the eighth of one wide ; of a form between lanceolate and linear : it differs in no other respect.

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No less common upon the shores of Britain than *F. filiquosus*, this species, like that, is fortunately provided with air-bladders, so peculiar in form, texture, and situation, that, under all its varying appearances, there can be no fear of its being mistaken by any botanist who will but attend to that single circumstance. Besides these it has, also, several peculiarities which remove it widely from the other English coriaceous Fuci : its root is not expanded into a large disk, or cone ; but rather, like that of *F. tuberculatus*, formed of a few thick shoots, fastened to the rocks by very slightly-dilated bases ; the diameter whereof, in some specimens now fresh before me, is hardly more than the eighth part of an inch, so that the



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power they possess of sustaining, by the mere adhesion of so small a surface, a plant so large against the fury of the waves, is almost beyond the power of human imagination. For toughness of substance *F. nodosus* far exceeds all the others, and differs widely from *F. vesiculosus*, in its frond being destitute of a midrib, and no where expanded into parts less thick than the rest, nor provided with mucifluous perforations upon the surface, which is every where smooth and unvaried; whence Gmelin, somewhat triumphantly, draws a conclusive argument against the truth of Reaumur's theory of the fructification of these vegetables. The pedunculated, distichous pods, also, or leaves, as they are termed by Linnæus, wherein the fruit of this *Fucus* is contained, separate it strikingly from its congeners; it is, however, upon the shape, size, and number of these that its chief variations, which are numerous, depend; the two most important of these that have fallen under my observation I have particularly noticed, the rest it would be difficult to specify, the gradations between them being so small that they are hardly perceptible, so that it would be almost impossible to say where one ends, and the other begins. These pods are also not unfrequently wholly wanting, as Professor Esper has figured the plant



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in his t. 7, and thence considers their presence as a variety, not depending upon age or luxuriant growth. They are, however, evidently intended to contain the fruit; having performed which office they fall off, leaving upon the edge of the stem no traces of their having ever existed. The number of capsules in them is so great, that I was once from curiosity tempted roughly to calculate how many seeds a plant of this species contained; and I found, that, in a specimen little more than a foot long, and not very thickly provided with pods, the most moderate computation brought them to one hundred and ninety-two thousand; whence it may be judged, with what care nature provides against the destruction even of these neglected vegetables, which, from their peculiar situation, and the manifold injuries to which they are necessarily liable, must otherwise soon be extirpated. Gmelin's t. 1. B. f. 2, which in the list of the plates is called a variety, and which Mr. Lightfoot calls a trifling variety, appears to me so different, that I have not ventured upon quoting it. I am rather inclined to think it was intended to represent some foreign species, whereof the account is omitted, and indeed it approaches very nearly to a singular one from North America in the collection of Mr. T. F. Forster, of which



it is to be hoped, that he will soon favor the world with a figure and description.

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47.—FUCUS PYGMÆUS.

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F. fronde cartilagineâ dichotomâ apice dilatatâ palmatâ: tuberculis globosis terminalibus apice pertusis.—Fl. Scot. p. 964. t. 32.—With. iv. p. 100.

Fucus pumilus.—Fl. Ang. p. 584.

..... lichenoides.—Linn. Transf. iii. p. 193.

Lichen saxatilis, maritimus, muscosus, minimus, nigerrimus.—Micheli's Nov. Plant. Gen. p. 103.

On the coasts of Devonshire, Dorsetshire, and Cornwall—Scotland, Lightfoot.

Perennial—June—October, Hudson.

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Root a small callus, but slightly dilated, and giving rise to numerous, matted fronds, which, creeping, cover with a thick coat the rocks on which they grow. They are compressed, about a quarter of an inch high, and preserve through-

out a width which scarcely equals the third of a line, except near the summits, where they are somewhat dilated. Their mode of ramification is dichotomous, in which manner they are repeatedly divided at extremely short distances, so that their apices, which are very much crowded, have altogether an appearance of being palmated, or branched like stags' horns: these, when barren, are emarginate, and so blunt as to be often truncated; when in fruit they are lined with small, smooth, sessile tubercles, of the same colour and substance as themselves, remarkable for a perforation in their summit, which, in their earliest stage, looks like a slight puncture, but increases as they reach maturity, and leaves them at last quite excavated, like the youngest shields of *Lichen crispus*, or perhaps more properly those of *L. globiferus*. I have never been able to detect any seeds in these tubercles. The substance of the plant is cartilaginous; colour apparently black, unless held between the eye and light, when it is a dark glaucous green, but paler at the upper ends of the shoots.



Mr. Lightfoot first made this minute *Fucus* well understood by British botanists, and removed

it beyond the reach of doubt, by his admirable figure and description in the *Flora Scotica*, from which work much of what has been said in the preceding account of it will be found to have been borrowed. I have retained the name that he gave it, in preference to the far more apposite one bestowed upon it in the *Linnæan Transactions*; not so much on the score of priority, as because Gmelin had previously called, by the title of *lichenoides*, another very different species, since figured by Professor Esper, and approaching nearly to some individuals of that family of the genus *lichen*, which Acharius has distinguished by the appellation of *Physciæ*. It must at the same time be acknowledged that no species can well bear a closer resemblance to the lichens, or have a better claim to a name derived from that resemblance than the present; and that not only considered as to its fructification, but as to many other also important peculiarities. Its mode of growth, for instance, matting the rocks to which it attaches itself in dense patches, so that, viewed at a short distance, they look black with it; the situation that it chooses, where, instead of being under the water, it is not even exposed to the spray of the waves, except in the case of high tides; its erect, though humble stature, its hard, brittle texture when dry,

and its colour, are all circumstances that must strike the mind of every botanist; and these, added to its still more remarkable scutellate tubercles, I must candidly own, leave it doubtful in my mind to which of the two genera it really belongs. I wish those naturalists who are acquainted with this plant, and also live in the vicinity of Mr. Hudson's rare *Lichen fluviatilis*, would take the trouble of comparing them together, when I suspect they would find it utterly impossible to separate them. This, however, must be left to future investigation. There is no other British species with which *F. pygmæus* can well be confounded, or with which it has indeed any very close affinity: at first sight it most resembles Mr. Stackhouse's *F. pusillus*, and *cæspitosus*; but from both these its points of difference are too evident to need being enlarged upon. Its being confounded by the authors of the *Fl. Dan.* with their *F. pumilus*, t. 1065, (not 1066) is one of those errors at which it is impossible not to wonder, but for which it is equally impossible to account in any thing like a satisfactory manner. It is still more surprising that even Dr. Roth fell into this error in the second volume of his *Catalecta Botanica*.



48.—FUCUS ACULEATUS.



F. fronde cartilagineâ filiformi ramosissimâ; ramis linearibus spinosis; spinis marginalibus subulatis erectis.—Herb. Linn.—Buddle, p. 14.—Petiver, p. 29. n. 1.—Uvedale, n. 8.—Sp. Pl. p. 1632.—Linn. Transf. iii. p. 179.—Ner. Brit. p. 24. t. 8.—Fl. Dan. t. 355.—Fl. Ang. p. 585.—Fl. Scot. p. 924.—With. iv. p. 113.—Roth, Fl. Germ. iii. p. 452.

Fucus muscoides—Gmelin, p. 130. t. 12.—Esper, p. 116. t. 59.

..... *virgatus*.—Gunner, i. p. 45.

..... *angustifolius foliis dentatis*.—R. Syn. p. 48. n. 38.

..... *tenuifolius foliis dentatis*.—Moris. Hist. Ox. p. 648. s. 15. t. 9. f. 4.

β . *muscoides*—fronde teretiusculâ; ramis sparsis divaricatis flexuosis.

Fucus muscoides.—Sp. Pl. p. 1630.—Fl. Ang. p. 590.—Fl. Carn. ii. p. 403.

..... *contortus*.—Esper, p. 89. t. 43. (excl. syn. Gmel.)

..... *aculeatus*. β . *caudatus*.—Fl. Scot. p. 926.?

On the southern and western shores of Britain,
not unfrequent.

Perennial—February, Mr. Stackhouse.



Root a small, scarcely-expanded callus; frond two or three feet high, rising with an almost cylindrical, tough, ligneous stem, about the size of a crow's quill; beset in an irregularly distichous manner with a greater or less number of branches, similar to it at their origin, except in their smaller size, but almost immediately becoming compressed; seldom above a third of a line wide, and linear throughout; once or twice sub-divided in the same way with shoots generally disposed at short distances, though occasionally so numerous that the plant resembles the tail of a sorrel horse, to which it has been frequently, and by no means inaptly compared: the extreme branches extend to a considerable length undivided, and are edged on both sides with soft, subulate, erect spines, from one-fourth of a line to a line high; arranged at a greater or less interval from each other; for the most part disposed alternately, but sometimes without regularity, and not unfrequently in alternate pairs: at the base of these may often be found what Mr. Stackhouse considers the fruit, and has

described as consisting of an irregular, echinated wart-like excrescence, which expands when ripe, and falls down the branches, exposing to view a beautifully granulated surface, yellowish, studded with brown. A faint appearance of a dark midrib is observable in some specimens of this *Fucus*; and some others, most probably from accident, are almost entirely stripped of their marginal spines. Its substance is cartilaginous, of different consistence in different individuals; either uniform throughout, or thin and almost membranous towards the extremities. Its colour is a pale, tawny green, sub-diaphanous near the ends of the shoots. It has its frond sub-cylindrical; its branches scattered, divaricated, and flexuous.

The variety of this plant here described is introduced rather for the sake of referring to Linnæus' and Hudson's *F. muscoides*, than because any observations of my own enable me to consider it entitled to such a distinction. I am not indeed by any means sure that I have ever seen it; for the specimens, which some eminent botanists have favoured me with under that name, differ in their dried state so very little from the common appearance of the species, that, either they must have been widely dissimilar when recent, or the

author of the *Flora Anglica* must have in this, as well as in the following species, departed far from his usual caution, and separated them upon very insufficient grounds. The soft, erect spines of this *Fucus* are so singular in their appearance, that they fortunately render it almost impossible to be mistaken. Were it not for these, it may fairly be concluded that hardly any one would be involved in more obscurity, for the diversity of breadth, colour, and substance of different specimens is extremely great, and what is still more likely to add to the confusion is, that those which are washed on the shore are very seldom found provided with any stem, so that many botanists have seen it only in a mutilated state, which not improbably is the reason why Linnæus first separated it, and afterwards, conscious of his error, corrected it in his second *Mantissa*, by making the one a variety of the other. But for this latter circumstance it might have been doubted how far his *F. muscoides* was really known to us; for what he says in the *Species Plantarum*, that, when dried, it cannot be distinguished from a moss, is far from applicable to any specimen I ever saw, even allowing for a considerable stretch of imagination. Whether Lightfoot's β belongs to the situation in which it is placed above, or ought to constitute a third

variety, is more than I am able to determine, having seen no authentic specimen of it, and I have therefore quoted it with a mark of doubt. Professor Esper's *F. aculeatus* is a very different species, and his *muscoides* is drawn from such imperfect pieces, that I should have hesitated in referring to it, had he not obligingly favoured me with specimens. His *F. contortus* well represents it; but he has erred in his reference to Gmelin's plant of that name, t. 22. f. 1, which is clearly intended for one of the appearances of the *Ulva filiformis* Fl. Ang. The proper situation of this *Fucus*, in the arrangement of the genus, is a point by no means easy to determine; for, considered as to its stem, the central part of its branches, and their extremities, it lays claim alternately to a place among those which are cylindrical, compressed, and flat: in this respect I have followed my predecessors, and have, moreover, on my side the old proverb, that, "*medio tutissimus ibis.*" Mr. Sowerby and myself found some specimens near the Lizard Point, in which most of the primary branches grew from the stem in a sub-verticillate manner, and seemed to originate from bulb-like knobs: most probably, however, this variety originated in accident.

49.—FUCUS PINNATIFIDUS.



F. fronde cartilagineâ ramosâ; ramis sub-alternis decomposito-pinnatifidis; ramulis obtusis callofis; tuberculis sessilibus ovatis.—Buddle, p. 18. n. 7, 8.—Petiver, p. 25. n. 1.—Uvedale, p. 12. n. 4.—Act. Paris, 1712. p. 34. t. 4. f. 6. Micheli's Marine Plants, t. 37. f. 1.—Fl. Ang. p. 581.—Fl. Scot. p. 953.—Linn. Transf. iii. p. 167.—With. iv. p. 106.—Ner. Brit. p. 48. t. 11.

Fucus corymbiferus.—Esper, p. 136. t. 94. (excl. fyn.)

..... multifidus.—Fl. Ang. p. 581.

..... membranaceus acaulos angustior, foliis palmæ ferè in modum divisâ, marginibus laciniatis et veluti crispis.—Moris. Hist. Ox. iii. p. 646. s. 15. t. 8. f. 2.

..... Dealensis Pedicularis rubrifolio.—R. Syn. p. 48. n. 37.

..... ramosus piperis sapore.—R. Syn. p. 51. n. 55.

℞. osmunda—fronde planâ sub-indivisâ; ramulis brevibus multifidis.—Micheli's Marine Plants, t. 37. f. 2.

Fucus osmunda.—Gmelin. p. 155. t. 16. f. 2.—

Esper, p. 121. t. 62.—Ner. Brit. p. 47. t. 11.

..... *filicinus*.—Fl. Scot. p. 954. (excl. syn.)

γ . *angustus*—fronde compressâ; ramulis clavatis confertis sub-simplicibus.—Micheli's Marine Plants, t. 37. f. 3.

Fucus pinnatifidus.—Gmelin, p. 156. t. 16. f. 3.

δ . *tenuissimus*—fronde compressâ; ramulis divaricatis ramosis tenuissimis.

α and γ are found on most parts of the British coast; β and δ in Cornwall, Mr. Stackhouse.

Annual—July—September.

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Root solid, but with a tendency to be fibrous; creeping, and producing numerous compressed, nearly flat fronds, of uniform substance throughout, and generally quite linear. In height they vary from two to six inches; their width is usually about a line. They are almost immediately near the base pinnatifid with distichous, sub-alternate branches, which continue at irregular distances from each other to the extremities, where they are blunt and rounded. Their length is very uncertain; they shoot out in a patent direction. These are again clothed with a second set, similar, except in size, to themselves; and these second



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again with a third. The extreme shoots, or ramuli, are short, blunt, and callous: in general simple, but sometimes cleft into others still smaller, near the ends of which are placed ovate, diaphanous, pale tubercles, about the size of mustard seed, full of darkish, minute grains, sessile, and in maturity dying away, at which time, from their falling off, and carrying with them the part of the frond to which they were attached, the apices of the branches have a more truncated appearance than is natural to them, and may be found covered with the seeds that they contained, scattered like the fruit of an *Ulva*. The substance of this *Fucus* is cartilaginous, but tender and succulent; and, if long kept in fresh water, approaches to gelatinous. Its colour, in a recent state, is a semi-transparent, purplish brown, which, in decay, changes to pale pink, and yellowish.

$\beta$ , which is considered by Gmelin, Stackhouse, and Esper as a distinct species, has a flat frond, not linear as in  $\alpha$ , but considerably widest about the middle, where it equals three or four lines, and instead of being cleft into numerous, long, straggling branches, seldom produces more than four or five of them, but is on either side closely beset with short, thick, generally multifid ramuli. Mr. Stackhouse has observed that it is destitute of



the peppery aromatic taste and smell so remarkable in pinnatifidus.

The frond of  $\gamma$  is but so slightly compressed as to be almost cylindrical; is linear, and not larger than small fiddle-strings: but what most strikingly characterizes it is, that the ramuli are long, undivided, of a sub-clavate form, and clustered towards the summits of the branches, the lower parts of which are unprovided with any.

$\delta$  differs strikingly from all the rest in its compressed frond being cleft into very numerous, divaricated, repeatedly-divided ramuli, much more narrow than the branches: it is also an extremely small variety, hardly exceeding an inch in height.



The variation of form and size, observable in different individuals of this Fucus, are so numerous and remarkable, that its having been divided by botanists into several separate species, is by no means surprising. All of them, however, may easily be traced, from the very broadest specimen of Gmelin's osmunda, to his narrow, nearly filiform pinnatifidus, through a series of regular, almost imperceptible gradations; whence it is no longer possible to keep them distinct,



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though it still appears best to consider them separate varieties; as, by so doing, not only the synonymy, which is considerably perplexed, but the plant itself, will probably be better understood by future botanists. In enumerating these varieties, it may seem strange, that the *F. multifidus* of Hudson has not been particularly dwelt upon, but some authentic specimens of that plant, which I owe to the kindness of Sir Thomas Frankland and Mr. Davies, as well as the reference in the *Flora Anglica* to Morison's figure, prove it not entitled even to that trifling distinction. Among the writers of this country, the present *Fucus* has generally obtained the English name of pepper dulce, from an acrid and unpleasant taste, as well as smell, which it possesses when recent; and which strongly serves to characterise it; yet, spite of which, Mr. Lightfoot informs us, that the people in Scotland eat it as a salad. Considered as to its ramification, its nearest connection is with some of the appearances of *corneus*, but, regarded as to its texture, habit, and fructification, it is far more closely allied to *F. dasyphyllus* and *obtus*, between some specimens of which latter, and the narrow varieties of the present, the affinity is very great indeed; but, when it is in fruit, it may certainly be known by its ovate,



pointed capsules, sessile on the upper parts of the ramuli, and from corneus it is at once distinguished without any difficulty, by its succulent substance, as well as greater breadth and linear frond, with blunt, rounded apices. Professor Esper's having mistaken it for the corymbiferus of Gmelin is a strong proof of the danger of describing these plants, without an acquaintance with them in their recent state; yet, in justice to that author, it must be added, that, he remarks it is very nearly allied to the *F. osmunda*, which he had previously figured. The variety noticed in the *Nereis Britannica*, and there said to cover rocks with its dense patches, seems to be only the common appearance of the plant in its earliest stage of growth.

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#### 50.—FUCUS CORNEUS.

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*F. fronde cartilagineo-corneâ ramosissimâ; ramis utrinque attenuatis sub-bipinnatis; pinnis oppositis patentibus obtusis, apice tuberculiferis.*  
—Buddle, p. 38. n. 1.—Petiver, p. 25. n. 6.



(large specimen.)—Fl. Ang. p. 585.—Linn.  
 Transf. iii. p. 181.—With. iv. p. 117.—Ner.  
 Brit. p. 61. t. 12.

*Fucus spinosus*.—Gmelin, p. 161. t. 18. f. 3.

..... *pumilus*.—Ner. Brit. p. 16. t. 6. ?

..... *flavicans teretifolius*, ramulis pennatim enascentibus.—R. Syn. p. 50. n. 49.

*β. filicinus*—fronde tenuissimâ; pinnis horizontalibus dilatatis obtusissimis.—Linn. Transf. iii. p. 181.

*Fucus filicinus*.—Fl. Ang. p. 586.

..... *nereideus*.—Fl. Scot. p. 956.

*γ. pinnatus*—fronde tenui tripinnatâ; pinnis patentibus sub-linearibus obtusiusculis.—Linn. Transf. iii. p. 181.

*Fucus pinnatus*.—Fl. Ang. p. 586.

..... *sericeus*.—Gmelin, p. 149. t. 15. f. 3.—Esper, p. 158. t. 71.

*δ. uniformis*—ramis ramulisque patentibus basi attenuatis sparsis obtusis.—Linn. Transf. iii. p. 181.

*ε. capillaceus*—fronde tenui; pinnis apicem versus confertis sub-setaceis erectiusculis.

*Fucus capillaceus*.—Gmelin, p. 146. t. 15. f. 1 ?

*ζ. deformis*—fronde tortâ pinnatâ; pinnis divaricatis oblongis brevissimis indivisis.

*α, β, γ, and δ* are found on the coasts of Devon-



shire and Cornwall;  $\epsilon$  at King's Cove;  $\zeta$  at Exmouth, Sir Thomas Frankland.

Perennial—May—October, Hudson.

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Root a small, expanded disk, throwing out a profusion of creeping, matted suckers, whence arise numerous fronds, two or three inches high, and about the same width, measured from the ends of the lower shoots, while floating in water; divided without regularity, but, for the most part near the base, into a few long branches, which taper to a narrow point, and are almost cylindrical at each extremity, yet quite flat in the center, and nearly a line broad: these are clothed throughout their whole length, more or less closely, with shoots similar to them in every respect, except their smaller size, arranged in a sub-pinnated manner, though without any fixed order; some of them once, or even twice again divided in the same way: the extreme ones being bluntish at their points, disposed in a patent and generally opposite direction; about two or three lines long, almost linear when barren, but when in fruit swollen at their apices, so as to present the appearance of minute, oblong, or ovato-

oblong tubercles; which, examined under the microscope, will be found full of very minute, darkish seeds. The substance of this Fucus is cartilaginous, extremely thin, and almost horny: its colour a bright and pleasing, but opaque red, which soon fades, and in a very short time changes completely to white.

β is so very narrow as to be hardly larger than horse-hair, except in its extreme pinnæ, which are dilated, blunt, and almost clavate: its whole height scarcely equals an inch, and its mode of growth is remarkably bushy and clustered: all its shoots are horizontal, and its colour a very deep, purplish red.

γ often rises in height above six inches, and is very much branched, especially towards the upper part of its frond: it is conspicuous for its pinnated appearance, and all its shoots being of nearly equal breadth throughout; its apices are less blunt than those of either of the preceding varieties; its colour a dull brownish red.

δ in height even exceeds γ , its branches are patent, very numerous, and repeatedly divided in an irregular manner: they are nearly linear, but somewhat tapering at their insertion; the extreme pinnæ are long and rounded at their apices: its colour is a dark purplish red.

is generally rises with a single stem, naked near its base, but very thickly clothed towards the summits with pinnated branches, which are again divided in a similar manner; all of them narrowest at each end, yet even in their center not half a line wide; its extreme pinnæ are very long, generally simple and setaceous; they all bend upwards, but leave the branches with rounded angles: its colour is a very pale red; its height two or three inches.

ζ has only a single, undivided frond, about two inches long, nearly capillary at the base, but swelling in the center to the size of small pack-thread, and terminating with a bluntish point: towards the summit it is curved irregularly, as if deformed; throughout its whole length it is beset with scattered, simple, horizontal pinnæ, seldom more than two lines long, but sometimes one or two of them equalling half an inch in this respect; its colour is a dark, dull red.



That botanist to whom the task shall hereafter fall of writing the history of this plant, and describing, not only the varieties known in Britain, but those also which are produced by the shores of the Atlantic and Mediterranean, will, or I am

much mistaken, find the office of nicely separating its different appearances, and pointing out the limits marked by nature between these and the adjoining species, an office of far greater difficulty than he can readily imagine. For any person to satisfy himself of this, little more is necessary than to turn to the *Historia Fucorum*, in which, although only a very inconsiderable part of its most common appearances are enumerated, yet these are all made specifically distinct; and, even in our own country, where the plant, being comparatively rare, is of course found under no great diversity of forms, Mr. Hudson himself has separated it into three species, which, from the imperfection of his descriptions, were regarded by Gmelin and succeeding writers as the most doubtful Fuci in the *Flora Anglica*. Mr. Lightfoot appears, as well from his account as references, to have had a more just conception of it; and, though I have followed Messrs. Goodenough and Woodward in referring his *nerideus* to the second variety, because those gentlemen, having examined his Herbarium, are necessarily better able to decide than I can possibly be, I would nevertheless take the liberty of remarking, that from the *Flora Scotica* it seems fully evident he well understood the other appearances, and regarded them only as

accidental. The α , β , γ , and δ , above described, were first discriminated in the Linnæan Transactions, and the account of them there contained, together with specimens obligingly communicated by Dr. Goodenough, has enabled me to make the present work entirely correspond with his and Mr. Woodward's paper on the subject. Their observations respecting Mr. Hudson's corneus, pinnatus, and filicinus, are no less excellent than just; and it is clear to me that future botanists will be considerably puzzled in affixing the limits to them as varieties, instead of ever thinking about again making them separate species. The ϵ Mr. Sowerby and I found at King's Cove, near Marazion, in Cornwall, a spot abounding in rare Fuci; and from its apparently agreeing well with Gmelin's figure and description of his *F. capillaceus*, I rejoiced at the opportunity of particularly mentioning it, for the purpose of removing as far as possible the difficulties of the synonymy: it is, however, very different from the plant figured under that name in Professor Esper's *Icones*, t. 35; nor is the representation in the *Historia Fucorum* one on which implicit reliance can be placed, so that it seemed best to quote it with a mark of doubt. The remaining appearance, ζ , was given me by Sir Thomas Frankland; and, had not that

gentleman informed me that he found it both plentiful and constant at Exmouth, I should have considered it as merely accidental. It may well be compared to that variety of *Lichen pyxidatus*, made by some authors a distinct species, under the name of *deformis*. *F. corneus* being, not only from its pinnated mode of growth and ramification, but still more from its thin, horny texture, a species by no means likely to be mistaken for any other, it merely remains to add, that what Gmelin has described and figured under that name, p. 144. t. 14. f. 3. is a very different plant: that Professor Esper's *F. corneus*, p. 122. t. 63. is equally distinct from both; and that the *F. filicinus* of Wulfen, figured in Jacq. Coll. iii. p. 157. t. 15. f. 2. also appears to be a separate species, though nearly related to the δ of this work. The *F. plumula* of Esper, however, t. 107. though perhaps not yet found in Britain, is evidently only a variety of the present plant; and, with regard to Mr. Stackhouse's *F. pumilus*, I have subjoined a mark of doubt to the reference, not from any question how far it really belongs to *F. corneus*, but from a wish to induce other botanists to examine whether it is a curious dwarf variety, or whether it ought not more properly to be considered as the common appearance of the *Fucus* in its earliest

stage of growth. It deserves to be farther remarked that, although this species has always been supposed to have been unknown to Linnæus, there is a fine specimen of it in his Herbarium, named *F. cartilagineus*, which, from the number at the bottom, is evidently the plant intended under that name in the *Sp. Pl.*: together with it are four of Gmelin's *capensis*; and, as he evidently afterwards confounded them together, I have joined other authors in considering that as the species he really designed in the twelfth edition of his *Systema*, under the name of *F. cartilagineus*.

51.—FUCUS GIGARTINUS.*

F. fronde cartilagineâ lineari sub-dichotomâ; ramis acutis spinoso-dentatis; dentibus subulatis horizontalibus: tuberculis globosis sessilibus.—

Herb. Linn.—*Syst. Nat.* p. 719.—*Linn.*

Transf. iii. p. 183. t. 17. f. 3, 4.—*E. B.* t. 908.

—*With. iv.* p. 111.

Fucus pistillatus.—Gmelin, p. 159. t. 18. f. 1.

Cornwall, Mr. Stackhouse.

Perennial.

Root an expanded callus, common to numerous, compressed fronds, four or five inches high, about the tenth of one wide, and nearly linear throughout, which in general rise with a stem undivided till it reaches the distance of an inch or more from the base, when it becomes forked, and afterwards repeatedly dichotomous at very short distances, with branches similar to it in every respect, and of uniform substance, though uncertain lengths, all of them ending in acute points. These, especially towards their apices, are more or less closely beset with distichous, horizontal teeth, or ramuli, one or two lines long, generally simple, and producing, at or near their extremities, minute, globular, sessile tubercles, smaller than the smallest grape-stones, which in shape and appearance they considerably resemble. The ramification of this species, though always with a tendency to dichotomous, is often by no means regularly so, nor is it uncommon to meet with specimens in which the branches seem rather disposed in a distichous series. The teeth, or footstalks of the tubercles, most frequently subtend, and continue to a short distance beyond them; but this is by no means certain. This plant in its substance is quite cartilaginous; its colour is a deep, brownish purple, which in decay changes to light green,

and, from exposure to the sun, becomes pale yellow, and horny, like the compressed varieties of *F. crispus*.

Very few specimens of this rare *Fucus* are known to have been hitherto found upon the shores of Britain, and those few have been wholly confined to the county of Cornwall, where it was first discovered, not many years ago, by the Hon. Dr. Wenman, and has since that time been gathered by Mr. Stackhouse, through whose friendship I have been enabled to draw up the above description from a native plant, aided by an extremely fine specimen, communicated by Dr. Nöhden, from Portugal, in which country it was gathered by Professor Link, and appears to be of by no means unfrequent occurrence. Both Gmelin's figure and account of this species are so very imperfect, that, had not the synonym above quoted been pointed out by the acuteness of Professor Mertens, it might have remained long unnoticed, though it seems evidently to belong to the present plant. Linnæus' description in the twelfth edition of his *Systema Naturæ* is on the contrary highly characteristic, and he has clearly fixed upon its most striking character, in calling the fructification

terminal "subjacente aristâ;" for, though this is far from being always the case, it is most frequently so, and when the tubercles are completely placed on the apices, they have a singularly imperfect appearance, as if the point being broken off had been the effect of injury. This circumstance, added to their spherical form, and the linear branches with acute terminations, renders it at first sight very easily distinguishable from *F. corneus*, to which alone it bears any close resemblance. Its mode of ramification besides, if not constantly regularly dichotomous, is far from pinnated, and it is always remarkable for the spinous appearance of its upper branches. The *F. gigartinus*? of the *Flora Danica*, t. 394, is an extremely dissimilar species.

52.—FUCUS CARTILAGINEUS.

F. frondē cartilagineā decomposito-pinnatâ infernè nudâ; pinnis horizontalibus alternis sub-linearibus, extremis brevissimis obtusis apice tuberculiferis.—Buddle, p. 38. n. 2.—*Syst.*

Nat. p. 719.—Esper, p. 14. t. 1.—Fl. Norv.

ii. p. 108. t. 3. f. 5.—With. iv. p. 119.

Fucus capensis.—Gmelin, p. 157. t. 17. f. 1.

..... *verficolor*.—Gmelin, p. 158. t. 17. f. 2.

..... *vindicatus cartilagineus*.—Fl. Norv. ii.
p. 123.

Freshwater Bay, in the Isle of Wight, Dr. Withering,

Perennial.



No specimen that I have seen of this *Fucus* has been provided with a root; its stem is a foot or more high, slightly compressed, about the thickness of a small crow-quill, and nearly of the same size throughout, naked at the bottom, and almost for half its length; then pinnated with horizontal branches, generally arranged alternately, but sometimes without a fixed order; the lowest longest, the rest gradually shortening, so as to give the outline of the plant a pyramidal form: these are in a similar manner beset with others, which in their turns produce a third set still smaller, and the gradation not unfrequently continues to a fourth, or even a fifth: those of the last series are always extremely short, blunt, nearly of a clavate shape, and often much rounded at their apices. In this

latter respect, however, they are liable to much variation, as specimens may occasionally be found in which they have somewhat of a fubulate appearance, being, though blunt at their extremities, smaller there than at their insertion. At the time of fructification the summits swell into oblong or oval tubercles, nearly as large as turnip-seed, which are generally acuminate, and sometimes the point extends so far as to bear a second, in a manner resembling, however faintly, the vesicles of *F. concatenatus*. The extreme pinnæ on this plant are very numerous and much crowded, but the terminations of the shoots, from the branches being disposed at some distance from each other, and there almost wholly undivided, have a singularly naked appearance. The substance is cartilaginous; colour a dark, sub-diaphanous purple, but so fugitive, that specimens are very seldom found in which a considerable part at least has not changed to a bright yellow, or reddish brown.

In one of the last letters that I had the pleasure of receiving from Dr. Withering a very short time before his death, he acquainted me with the circumstance of this *Fucus* being found in the place above mentioned, and I have since seen

specimens of British growth communicated by him to Mr. Woodward, so that its claim to a place in our Flora can no longer be disputed; and it is with the most sincere pleasure that I avail myself of this opportunity of paying a tribute of respect, however trifling, to the memory of a most candid and instructive correspondent, by adding, upon his authority, an highly ornamental species to the catalogue of British Fuci. In the history of *F. corneus* it has been already stated, on the faith of the Linnæan Herbarium, that the present does not seem to be the plant originally designed in the *Species Plantarum* under the name of *F. cartilagineus*, though the references in the *Mantissa* to Gmelin's *versicolor*, and in the *Systema* to Seba, render it more than probable that it is what was really intended in the latter work. Between the *F. capensis* and *versicolor* there does not appear to be the least difference, except that the description and figure of the one are made from a perfect, of the other from a mutilated specimen; and it would be difficult to offer any satisfactory conjecture upon the causes that influenced the author of that work to separate them. Linnæus, by referring to the former of these for a representation of his *F. abrotanifolius*, has created great confusion, as has been previously noticed under that species.

Of the present plant Professor Esper has given an excellent figure; but, not content with joining it with *abrotanifolius*, he has added to them *gigartinus*, supposing that *Fucus* to be nothing more than the plant in a state of fructification. The nearest connection, however, of this species is *F. corneus*, from which its principal difference lies in the general habit, and thicker substance. From *F. gigartinus* it is distinguished by the altogether dissimilar mode of growth, as well as the shape and situation of its tubercles: lest there should be any fear of its ever being confounded with *F. coronopifolius*, it may be well to mention the scarlet colour of that species, as a character, which will, without farther trouble, always suffice to keep it very separate from the dull, purple hue of *F. cartilagineus*. The Cape of Good Hope produces this *Fucus* in immense abundance.

53.—FUCUS CORONOPIFOLIUS.

F. fronde cartilagineâ ramosissimâ; ramulis multifidis sub-secundis linearibus; tuberculis globosis pedunculatis; pedunculis distichis bre-

vissimis.—Buddle, p.12. n.1.—Petiver, p. 25.
n.3. and p.42. n.6.—Linn. Transf. iii. p.185.
—Ner. Brit. p. 82. t. 14.

Fucus cartilagineus.—Fl. Ang. p. 586. ?

..... *coronopi facie*.—R. Syn. p. 45. n. 23.

On the shores of the Isle of Wight, the Isle of
Portland, and Cornwall.

Perennial—October.

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Root an irregularly-shaped, callous knob;  
frond in general solitary, compressed, seven or  
eight inches high, and in its primary shoots above  
the fifth of one wide; divided immediately at the  
base into two or three branches, which are some-  
times repeatedly dichotomous, or palmate, but  
most frequently beset with several others, arranged  
without any certain order in a sub-distichous series,  
all of which are again and again divided in the  
same manner, and gradually decrease in size, till,  
towards their apices, they are multifid with nu-  
merous, almost clustered, narrow, linear, obtuse,  
branching ramuli, a quarter of an inch or more  
long, beset with others still smaller, and sub-in-  
curved, placed in greater proportion on one side  
of them than the other. The angles of the rami-  
fication throughout the whole plant are very



blunt. The fructification consists of minute, globular tubercles, far smaller than poppy-seed, of a dark-red colour, supported on peduncles which are scarcely a quarter of a line long, copiously placed in a distichous manner on either side of the upper branches. The tubercles are sometimes tipped with an extremely short point, and sometimes their peduncles are wholly wanting, so that they appear altogether sessile on the frond. The substance of this Fucus is cartilaginous, thicker in the middle than at the sides of the branches; its colour a sub-diaphanous scarlet, which, however, is very fugitive, and turns, from exposure to the air, or from being kept in fresh water, to a pale green and white.

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For want of a single word by way of description in the Flora Anglica to characterize the plant intended by Mr. Hudson under the name of *F. cartilagineus*, it must always remain a matter of some uncertainty whether he designed the present or preceding species; or whether, which is possible, though hardly probable, he either confounded them together, or, knowing both, did not consider them entitled to be regarded as distinct. The *F. coronopi* facie of Ray, to which

he refers, as also to Buddle's Herbarium, is, upon the authority of the authentic specimen there preserved, the *Fucus* here described; but Seba's *frutices marini*, and Gmelin's *F. versicolor*, are beyond all doubt the *F. cartilagineus* of Linnæus; and, besides this, the specific character in the *Flora Anglica* is, with the omission of a trifling word, copied verbatim from the *Systema Naturæ*; all which, while it involves the question in much obscurity, makes it also a matter of very little importance whether it is ever decided. This plant, which is far from uncommon on the shores of the Isle of Wight and of Cornwall, if dried before it loses its colour, deserves a place among the most beautiful British Algæ: considered as to its habit and mode of ramification, it approaches most closely to the following; but, if its substance be rather regarded, it is more allied to the preceding species: in fructification it differs almost equally from both, and in the disposition of its peduncles manifests a nearer affinity to *F. gigartinus*. It was first satisfactorily ascertained, and established as specifically distinct from all its congeners, by Dr. Goodenough and Mr. Woodward, in their Observations on the British Fuci. I am indebted to the kindness of Dr. Smith for some specimens of it, which were originally in the possession of

Linnaeus, and were sent him from the Island of Ceylon, but which he had never taken the trouble to expand.

54.—FUCUS COCCINEUS.

F. fronde membranaceo-cartilagineâ ramosissimâ; ramulis subulatis alternatim secundis: tuberculis globosis sessilibus.—Buddle, p. 29. n. 1, 4.—Petiver, p. 26. n. 1.—Fl. Ang. p. 587.—Linn. Transf. iii. p. 187.—With. iv. p. 119.—Ner. Brit. p. 106. figure at the frontispiece.

Fucus plocamium.—Gmelin, p. 153, t. 16. f. 1. (excl. syn. Linn.)—Esper, p. 18. t. 2. f. 1, 2, 3, 4, 6.—Fl. Scot. p. 957.

Ceramium plocamium.—Roth, Fl. Germ. iii. p. 458.

Fucoides rubens variè dissectum.—R. Syn. p. 37. n. 1.?

On all the parts of the British coast, frequent.

Perennial—June—October.

Root fibrous, throwing out numerous shoots, which give rise to several filiform, compressed fronds, generally about four or six inches high, and seldom so much as half a line wide; divided immediately near the base into many long, erect, slightly flexuose branches, which are pinnated with an irregularly alternate series of others, similar to them, except in their smaller size, and these often again and again divided in the same manner; the extreme ones being always furnished with small, subulate ramuli, two or three lines long, somewhat incurved, and arranged, at very short distances from each other, on either side, in alternate parcels of two, three, or four. Their upper surfaces, to borrow Lightfoot's words, are curiously pectinated, or finely toothed like a comb, the smallest of these teeth being scarcely visible to the naked eye. Some of these little bundles are also often dispersed over the primary and secondary shoots, always preserving the same alternate order, and occupying what would otherwise be naked spaces between each branch, so as thereby to add much to the beauty of the plant. The fructification consists of globular tubercles, as large or larger than poppy-seed, not very numerous, of a pale-red colour in their early stage, but nearly black when ripe; sessile on the sides of the upper

shoots, where they are dispersed without order. The seeds may easily be seen in them with the assistance of a glass. The colour of this Fucus is a sub-diaphanous and most beautiful tint, between crimson and scarlet; but it soon grows pale, and changes to a light, greenish yellow, or white. Its substance is somewhat cartilaginous, though always extremely thin; and, after it is dried, perfectly membranaceous.

β , instead of producing its seeds in globular tubercles, bears them in subulate or lanceolate capsules, placed on the upper branches, and generally arranged in a sub-racemose manner, but occasionally only binate, or even single; of a dark colour, and so small as to be almost invisible to the naked eye. In a single specimen found by Mr. Mason on the Yarmouth beach, these capsules are linear and capillary, two or three lines long, repeatedly branched, and disposed in almost globular clusters.

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The curious circumstance attending this Fucus of its producing two distinct kinds of fructification, in each of which seeds are most easily discernible, has induced the author of the Nereis Britannica to make it a part of the specific character that its fruit is polymorphous. In this



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respect it has appeared to me most safe to differ from him, and rather, as the globular and lanceolate capsules have not hitherto been detected on the same individual, to regard them as distinct varieties. There can indeed be but little question of their being in reality separate species; but, as the ramification and texture of each are precisely the same, and at Yarmouth, where they are equally abundant, neither Mr. Wigg nor myself have been able to fix upon a single mark whereby they may be distinguished in a barren state, I am under the necessity of leaving the task of separating them to some more accurate, or more fortunate observer; remarking at the same time, as a general, though far from constant rule, that the frond of  $\beta$  is somewhat more narrow than that of  $\alpha$ . This Fucus, the most common, perhaps, of all that are natives of the British shore, though liable to much diversity of colour and size, is always with the greatest ease, recognized by the disposition of its ramuli, which Mr. Stackhouse has happily called triplicato-alterni; nothing, therefore, needs be said farther to distinguish it from its congeners. In point of beauty it yields to very few, and is an universal favorite with ladies, who amuse themselves in arranging these vegetables into landscapes of fantastic forms. That Linnæus en-



tirely overlooked it must be considered as a matter of no small surprize: there is a piece of it in his Herbarium, on the same paper with that which is marked cristatus, so that it may possibly be supposed he regarded it as a variety of that plant; but they are so different that such a supposition is hardly probable. Gmelin was certainly wrong in referring it to the cartilagineus of the Species Plantarum. With regard to the synonym of Ray above quoted, I will here insert the opinion of Mr. Dillwyn, who has studied the subject more attentively than I have, and with it close the account of this beautiful Alga. "Hudson, as well as Messrs. Goodenough and Woodward, refers to Ray's p. 37. n. 1.; but Hudson also refers, and properly, to the "Muscus marinus, foliis oblongis, Millefolii ferè divisurâ," of Ray's Hist. 79. n. 25, as his Conferva coccinea; and Ray here confounds them together. The three only figures to which Ray refers, Pluk. t. 48. f. 2, Parkinson, 1289, and Clusius, 250, (though Hudson erroneously calls this last F. coccineus) are decidedly and positively C. coccinea. Petiver, who may be supposed to have well understood Ray's plants, named his specimen of F. coccineus, "Muscus marinus rubens pennatus nostras, R. Hist. 78. n. 14." which Ray makes here synonymous. My



opinion therefore is that, when Ray published his *Historia*, he distinguished *F. coccineus* from the *Conferva* of the same name; but afterwards, in the third edition of his *Synopsis*, confounded them together, and that no reference for either of these plants should be made to the *synopsis*, but that the "*Muscus marinus rubens*," &c. *R. Hist.* is *F. Coccineus*, and the "*Muscus marinus purpureus*," &c. is *C. coccinea*."

### 55.—FUCUS PLUMOSUS.

*F. fronde sub-cartilagineâ ramosissimâ; ramis supro-decomposito-pinnatis; ramulis oppositis, apice tuberculiferis: tuberculis maturis quadrifidis.*—*Herb. Linn.*—*Buddle*, p. 29. n. 7.  
—*Linn. Mant.* p. 134.—*Syst. Nat.* p. 718.—*Gmelin*, p. 152.—*Esper*, p. 92. t. 45.—*Fl. Dan.* t. 350.—*Ner. Brit.* p. 105. t. 15.—*Fl. Ang.* p. 587.—*Fl. Scot.* p. 955.—*Fl. Norv.* ii. p. 91.

*Fucus pectinatus.*—*Fl. Norv.* ii. p. 123. t. 2. f. 8.

..... *ptilotus.*—*Fl. Norv.* ii. p. 135. t. 2. f. 15.

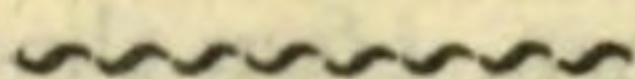


*Fucoides purpureum elegantè plumosum.*—R.

Syn. p. 38. n. 2. t. 2. f. 5.

In Cornwall, Mr. Stackhouse; Dover, Mr. Dillwyn; Scotland, Lightfoot.

Perennial—July—October, Hudson.



Root a small disk; frond from three to six inches, or more, high; every where compressed, and nearly linear, except that it tapers to the extremities: in its primary shoots about one third of a line wide: frequently and irregularly divided into numerous branches of uncertain length, which in their turns are pinnated with others, and these again with others still smaller; the extreme ones being always closely beset with short, subulate, patent, slightly-incurved ramuli, placed opposite to each other; sometimes simple, but generally feathered on each side with pinnæ so extremely minute as to be almost invisible, except with a microscope. At the time of fructification the ends of the ramuli swell into oval, or globular, blackish-red tubercles, which, when mature, burst into four or five segments, and, instead of falling off, as is the case with most Fuci, continue to adhere, giving the apices a multifid appearance:



though often they are dehiscient only in their centers, and continue to be united at their apices: The substance of this Fucus, though cartilaginous, is extremely thin and delicate, but less so than that of the preceding species: the colour of the lower branches is a deep, opaque purple, tinged with reddish brown, often almost black; that of the younger shoots is generally paler, and sub-diaphanous, but sometimes as dark as the others: when kept in fresh water, it changes to a dull, greenish brown.



Another and very striking instance is furnished by the present Fucus of the regular almost imperceptible gradations by which nature insensibly passes from one genus to another; and, instead of preserving in her operations one straight line, makes each individual, at different points, connected with the various others that surround it. The capsules of *F. plumosus*, far from being deciduous like those of *F. hypoglossum*, or perforated at their apices in a manner similar to those of many other species, continue to be permanent even after the seeds they contained are discharged; and bursting into four equal valves, dehiscient in their center, but often united at their summits,



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display an evident connection with those of the Linnæan *Jungermannia alpina*, well raised on that account by Ehrhart into a separate genus under the name of *Andræa*. The beautifully feathered appearance, whence this species derives its name, furnishes also one of its most striking peculiarities; and, added to its thin substance, will enable any botanist to distinguish it at first sight from *F. corneus*, to some varieties of which, in point of habit and ramification, it bears a very great resemblance. Few plants are liable to a greater diversity of size; and, as has been remarked by Lightfoot, those gathered in Scotland far surpass, in this respect, the specimens furnished by the southern coasts of England: they differ also materially in habit, for the branches of the northern ones are broader, and have their ramuli placed at small distances from each other, while those produced by the rocks of Dover are, throughout their whole frond, so narrow as to be almost capillary, and have their extreme shoots very much clustered. These latter most resemble a feather. In this state it is figured in Ray's Synopsis; in the other by Professor Esper, whose representation is not destitute of character, though he has chosen a gigantic and singularly party-coloured specimen. Gmelin has given no plate of



this species; his description too is very short; and he remarks that the ramuli are somewhat jointed, so that it may justly be suspected he confounded *Conferva coccinea* with it; or, perhaps, did not know this plant, which, even examined with the best glass, discovers no tendency to articulations. Both the figures above quoted in the *Flora Norvegica* evidently belong to *F. plumosus*, as the reverend author had himself been informed by Linnæus; but those in Dr. Esper's *Icones*, under the names of *pectinatus* and *ptilotus*, must surely have been intended for different species.

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## 56.—FUCUS TOMENTOSUS.

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*F. fronde teretiusculâ æquali tomentosâ dichotomâ obtusâ.*—Buddle, p. 34. n. 5.—Petiver, p. 42. n. 5.—*Fl. Ang.* p. 584. (excl. syn. Linn.)—*Ner. Brit.* p. 21. t. 7.—*Linn. Transf.* iii. p. 195.—*E. B.* t. 712.—*With.* iv. p. 107.

*Spongia dichotomos teretifolia viridis.*—*R. Syn.* p. 29. n. 3.



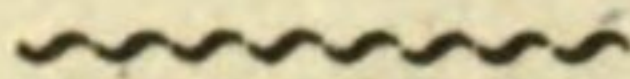
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*Fucus spongiosus teres ramosior viridis erectus.*—

Morif. Hist. Ox. iii. p. 647. s. 15. t. 8. f. 7.

At King's Cove and St. Michael's Mount,  
Cornwall.

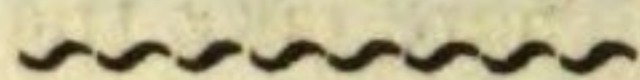
Perennial.



This *Fucus*, in the very earliest stage of its growth, invests, with a soft velvety covering, the rocks or marine substances to which it attaches itself; spreading over them, like a crustaceous Lichen, to a considerable extent before it begins to throw out any shoots. Hence the root is but an expansion of the frond, and the stems are numerous. They are either very slightly compressed, or entirely cylindrical, and rise to the height of about six inches, preserving throughout an almost unvaried size, nearly equal to that of a small goose-quill. Their ramification, every where dichotomous with somewhat obtuse angles, commences near the root, and continues, at short distances, to the apices, which are blunt, and for the most part so little cleft as to be only emarginate. The fruit is unknown. The whole plant is uniform in its substance, and composed of a mass of minute, matted, tubular, woolly fibres, most closely interwoven, and holding water like



a sponge. The colour, in a recent state, is a beautiful opaque olive green. The stem, on the authority of the Nereis Britannica, and Linnæan Transactions, is hollow within; but, in the specimens that have fallen under my observations, I have not found it so.



The singular structure of this plant, at the same time that it is sufficient immediately to separate it from every other of British growth, proves also the impropriety of allowing it to retain a place among the Fuci, its affinity with which is certainly little, if at all greater than with the Spongiæ. On this subject a very curious dissertation has been written by a learned Italian naturalist of the name of Olivi; who, after having carefully investigated its substance, structure, &c. formed from it, and from another nearly-allied vegetable, a new genus, which he called \* Lamarckia, illustrating one of

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\* The generic character is "Stirps radicata sub-coriacea mollis; composita utriculis in axim perpendicularibus.—Utriculi membranacei virides cylindrici approximati utrinque filamentis tubulosis tenuissimis connectentibus terminati.—Fructificatio. Globuli inter utriculos et filamenta sparsi."



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them (his \* *Lamarckia vermillara*) with a figure, which I have not seen, but which, Mr. Stackhouse says, is undoubtedly designed to represent our *F. tomentosus*. This same gentleman, in the third fasciculus of his *Nereis*, has translated one of the most essential parts of Olivi's treatise on the subject; and I shall here take the liberty of inserting his translation, referring those botanists who are desirous of farther information to the original work; of which a copy is to be found in the seventh part of Dr. Usteri's *Botanical Annals*. "The structure of the genus consists of bladders or tubes, hollow, pellucid, and filled with a transparent, aqueous fluid, together with other minute, capillary filaments for the purpose of imbibing water, and discharging the seeds, which are at this period easily to be distinguished: a structure in which these bladders and filaments are entirely composed of a delicate, equable, transparent membrane, perfectly similar in its texture, and in all other qualities to that of which *Fuci*, *Confervæ*, and *Ulvæ* are composed: a struc-

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\* He describes this plant "*Lamarckia stirpe ramosâ sub-dichotomâ. ramulis cylindricis apice obtusis.*"



ture, which, instead of dissolving and decaying away, grows firm, and hardens: which has not the least portion of animal substance, is not endowed with spontaneous motion, and emits no offensive smell on being destroyed. Its fructification, in fine, is like that of the Algæ, consisting of globular congeries of seeds in membranaceous pericarps." The other species of *Lamarkia* is the *Alcyonium bursa* of Linnæus; and to these may in all probability be added Mr. Woodward's *Ulva decorticata*, described by him in the third volume of the Linnæan Transactions. *F. tomentosus*, on a cursory view, seems nearly allied to *Conferva spongiosa*; but a closer investigation proves the resemblance to extend no farther than general appearance; for that plant and its congeners are all formed of short, closely-imbricated, setaceous ramuli, attached to a common center of a different substance to themselves: but in the present, all is uniform. Its having been considered tubular, as is above mentioned, probably arises from the circumstance of both sides collapsing, and exhibiting somewhat of an hollow appearance, if cut longitudinally through the center.





## 57.—FUCUS TUBERCULATUS.

F. fronde filiformi sub-dichotomâ \* inæquali; dichotomiarum angulis obtusiusculis: apicibus tuberculiferis oblongis obtusis.—Fl. Ang. p. 588.—Linn. Transf. iii. p. 198.—E. B. t. 726.

Fucus bifurcatus.—With. iv. p. 109. t. 17. f. 1.  
..... Kali geniculato similis non tamen geniculatus.—R. Syn. p. 43. n. 13.

Rocks near King's Cove, and St. Michael's Mount, Cornwall.

Perennial.—June—October, Hudson.

Root a small disk, furnished with a few, very short, thick fibres, extending horizontally, and

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\* I have used the term inæqualis in this case in opposition to fastigiatus, to denote that the branches are of unequal height; which I have thought best to mention, fearful that I should have a difficulty in finding any precedent which would authorize the employing it in such a case.



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remarkable for bearing at their extremities single fronds, which rise from them directly at right angles; nearly filiform, but generally somewhat attenuated at the base, extending to the length of about ten inches, and almost equalling a small goose-quill in thickness; most frequently entire till they reach the distance of three inches from the root, then forked, and afterwards divided in a dichotomous manner, at very short distances with angles, sometimes, but rarely, acute, and sometimes quite obtuse, but for the most part less sharp than those of *F. lumbricalis*, and less rounded than those of *rotundus*. The length of the branches is unequal and uncertain, except that those nearest the bottom of the frond are shortest. The summits grow singly, and are oblong, blunt, and quite cylindrical, varying in length from half an inch to two inches: when in fruit they are always longest, and their surface is slightly marked with perforated tubercles, under which the seeds, of a pyriform shape and brown colour, lie in globular clusters, each containing eight or nine, invisible except by a transverse section being placed under a microscope. The substance of this plant is cartilaginous, almost approaching to coriaceous: colour, when fresh, a pale, olive green; when dry, quite black. I have never seen it with any



tendency to decay. The taste of those specimens which Mr. Sowerby and I found in Cornwall was pungent and nauseous beyond that of any species I ever tried; and I have found the same, though in a smaller degree, to be the case in some that were sent from another place, and had been long dried. If a thin, horizontal slice be cut from the frond, and subjected to a good glass, this Fucus will be found to differ from most others, by having a small, black, longitudinal line in the center, similar in appearance to what Colonel Velley observed in *Ulva elminthoides*.

To any botanist who has had an opportunity of seeing the present and two following species, even in a dried state, there can be little difficulty in distinguishing them at first sight; but still, aware how imperfect language often is to picture ideas to the mind, I shall endeavour to draw the contrast between them more closely than is done in the separate descriptions; and under this, as the first of them, briefly point out the leading marks of difference. The root in *F. rotundus* is solid and undivided; in *F. lumbricalis* formed of a congeries of thin, transparent, branching fibres; in *F. tuberculatus* in a measure uniting both these



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qualities, but with its disk very small, and its fibres remarkably short, thick, and opaque. The fruit in them is altogether dissimilar, but has been dwelt so much upon under each species, that any thing more which could now be urged on the subject would be mere repetition. Their stems, however, deserve farther notice; that of *F. tuberculatus* being twice as thick as that of either of the others, and neither so regularly cylindrical, nor so regularly dichotomous; in its earliest stage almost club-shaped, and, when fully grown, having the lower divisions remarkably distant, and the upper ones as remarkably close. The colour, also, affords a very striking distinction, especially in dry specimens; a circumstance first pointed out by the authors of "Observations on the British Fuci", and no less just than useful in the discrimination of them. *F. rotundus* in that state, when exposed to the light of a candle, is semi-transparent and red; *F. tuberculatus* invariably black: and *F. lumbricalis* either black, or a very dull, opaque brown, except in the short tips, which retain their pink hue. I trust that what is now written on this subject will be sufficient; there is much other highly accurate and curious matter respecting it in Dr. Withering's Botanical Arrangements, communicated to that gentleman



by Colonel Velley. The *F. tuberculatus* may be considered as one of the most rare of the British Fuci, having been hitherto found only on the south-west extremity of our island, and never there seen in any considerable quantities. All foreign botanists appear to be wholly unacquainted with it. The plant introduced in the *Flora Scotica* under this name, is the *F. purpurascens* of Hudson, and other British writers. In the situation and disposition of its fructification, this species indicates an affinity, which, from its other characteristics would be but little expected, with *F. vesiculosus* and its congeners.

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### 58.—FUCUS ROTUNDUS.

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*F. fronde filiformi dichotomâ fastigiatâ; dichotomiarum angulis subrotundis, apicibus bifurcis acutis: verrucis seminiferis difformibus lateralibus.*—Buddle, p. 11. n. 8.—Petiver, p. 20. n. 2. p. 31. n. 4, 6, 7.—Uvedale, p. 9. n. 1. (bleached)—Gmelin, p. 110. t. 6. f. 3. (excl. syn. *Fl. Ang. et Raii*)—With, iv. p. 110.



*Fucus radiatus*.—Linn. Transf. iii. p. 202.—Ner. Brit. p. 89. t. 14.

..... *fastigiatus*.—Ner. Brit. p. 15. t. 6. (quoad fig. min.)

$\beta$ . *tenuior*—segmentis extremis longis linearibus; apicibus obtusiusculis.

$\gamma$ . *fastigiatus*—fronde tenuissimâ vix biunciali.

*F. fastigiatus*.—Herb. Linn.—Sp. Pl. p. 1631.—Esper, p. 38. t. 16. (excl. syn.)—Wulfen, in Jacq. Coll. iii. p. 152. t. 14. f. 2.

$\alpha$  is not uncommon on most parts of the British shore;  $\beta$  at Yarmouth;  $\gamma$  at Falmouth.

Perennial.



Root a solid, expanded, leathery disk, common to a \* great number of filiform, cylindrical fronds, varying in length from four to eight inches, and in breadth from that of small twine, to that of a crow's quill: at their origin, simple, but, at the distance of an inch or more from the base, forked, and proceeding by frequent dichotomies, at short but uncertain distances from each other, to the extremities, which are sub-incurved, bifurcate, and subulate, ending in very acute points: the

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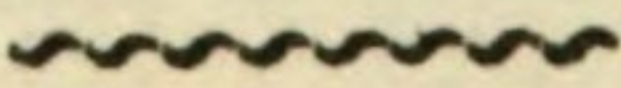
\* I have counted above 105.



angles of the divisions of the stem are all more or less rounded: its cylindricity, when fresh, is more remarkable than that of its congeners. The fruit consists of wart-like tubercles, scattered about the upper branches, seldom more than one or two on each; at first small, and almost globular, about the size of turnip-seed, but soon losing all regularity of form, sometimes running down one side of the frond to the length of two or three lines, and sometimes passing in an annular manner round it: of a pale pink, or flesh colour, and spongy substance, not covered by the epidermis of the frond, but apparently formed by both that and the interior part of the plant undergoing an alteration in their substance; full of minute, globular, dark-coloured seeds, invisible, except by cutting the warts into thin slices. The colour of the plant is brown, strongly tinged with purple, passing, when exposed to the air, to light green and white; when in decay, changing to pale pink. Substance cartilaginous.

$\beta$  is remarkable for its very thin stem; and the extreme segments, instead of being short and subulate, being long, linear, and bluntish at the ends.

$\gamma$  resembles  $\beta$ , but is still more thin, and its height seldom equals two inches.





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One of the most striking peculiarities attending this species, is the singular appearance it exhibits when beginning to decay; at which time, if observed in a basin of water, the frond looks as though it were covered in places, especially about the extremities, by a minute, woolly *Conferva*, which, when examined more closely, will be found to proceed from the epidermis peeling off in small, detached pieces, and some of them continuing to adhere to the branches, after all connection with the others is done away. This change does not for some time appear to affect the interior substance of the *Fucus*, but is wholly confined to the outer coat, nor have I observed it extend to the lower branches, so that the plant seems at that time composed of two different colours and substances. The mode of fructifying that obtains in *Fucus rotundus* is wonderfully curious, and different from that of every other known British species, except *Fucus Norvegicus*, and *tamaricifolius*, with which, in other respects, it has no affinity. That the seeds, instead of being fixed in parenchymous capsules under the epidermis, and there remaining sheltered from external injuries till they become ripe, should be situated in a soft, glutinous matter, and attached to the exterior surface of the frond, apparently



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without any protection against the impulse of the waves, or attacks of marine insects, is one of those circumstances which must occasionally arrest the attention of every man who is in the habit of observing the phænomena of nature, and looking through them up to Nature's God; but for which no one, however skilful or experienced, may venture to assign a reason. Another peculiarity attending the fruit of this Fucus is that, from its not exuding by pores through the epidermis, and thereby leaving the coat of the frond uninjured, but apparently obliging the whole plant to undergo an alteration of substance in the parts where it is situated, it necessarily follows that, when in maturity the seeds fall off and warts die away, cavities in the branches must remain, and the plant be considerably weakened. I have never had any opportunity of seeing it in this state, as it does not grow near Yarmouth, and is seldom washed on the beach, except in the months of autumn and winter; but it is a subject to which I would wish to turn the attention of the botanists who reside in the neighbourhood of its native rocks; and it is one that may possibly lead to some curious discoveries touching the internal organization of these plants. The perfect tubercles, when recent, are justly compared, by Messrs. Goodenough and



Woodward, to the head of *Sphæria entomorrhiza*, as represented in Dickson's *Plant. Crypt. fasc. i. t. 3. f. 4.*—I have used the word spongy to express their substance, because I am utterly unable to find any other more appropriate term; but I am nevertheless aware that this is not in all cases strictly applicable. Especially as they approach maturity if rubbed between the fingers, they separate into minute particles, and, when dried, adhere to the papers between which they are pressed. In outward appearance they much resemble the warts common to the human hand, and, like them, have an uneven and granulated surface, irregularly marked with furrows; but this circumstance is by no means constant. The plant figured by Professor Esper, t. 17, under the name of *F. rotundus*, is *F. canaliculatus*. The resemblance between this species and the following is so strong, and the difficulty of separating them, except when they produce their fruit, which happens only in the months of winter, is so great, that no botanist can possibly wonder at their having been blended together by most writers, and at their synonymy being thence peculiarly confused. Any one who would attempt to unravel so entangled a skein, must proceed with extreme caution, and admit no references that do not



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appear fully certain; for many authors on this subject have never seen the plants they describe, or have seen only single, perhaps mutilated, dry specimens of them, and thence form their accounts entirely from borrowing what their predecessors have written; so that much less danger can arise from altogether omitting what writers of this complexion have said, than from quoting their patchwork descriptions, in part applicable to different plants. From Linnæus' collection is apparent what otherwise probably never would have been suspected, that what he really intended for his *F. fastigiatus* in the *Species Plantarum*, is the same as the third variety of *F. rotundus* above mentioned; such at least appears the case from the numbered specimen: but, besides that, the Herbarium contains three others under the same name; two of which, sent by König, are the *F. plicatus*,  $\beta$ , of this work, and the remaining two are different species not yet described. How far Morison's t. 9, f. 9, referred to under the following plant, may not also belong to the present, is, I must own, at least to me, a matter of doubt, for there is nothing in the tips to prove the contrary, the angles of the dichotomies are somewhat rounded, and the root seems intended to have been made solid instead of fibrous. The



figure, however, is not so good as to make it a point of much consequence. This *Fucus* was not altogether unknown to Ray, but he mistook it for a variety of *F. lumbricalis*, as is clear from his observing at the end of his description, p. 45, n. 24, that the Rev. D. Manning had noticed that species with solid knots dispersed at intervals over the stems and branches; which knots could only be the fruit of *F. rotundus*. I have quoted Professor Esper's *F. fastigiatus*, t. 16, to the variety  $\gamma$ , on the authority of specimens from himself; and Baron Wulfen's description as well as figure is so clear, that I felt no doubt in referring to him also. I have never seen that variety in fruit, and am not, consequently, able positively to say that it may not be specifically distinct; but its habit, colour, ramification, and root agree so strongly with the present, that, spite of its dwarfish size, it seems most safe to leave it as nothing more than a singular appearance. *F. rotundus* often exhibits the same rings on the upper part of its shoots as *F. lumbricalis*, under which they are more particularly mentioned. Gmelin has a claim to the credit of being the first author who distinguished this species, and I have therefore retained his name, which, though perhaps less apt than that of *radiatus*, is sufficiently



expressive of the roundness of the angles, and cylindricity of the stem.

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59.—FUCUS LUMBRICALIS.

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F. fronde filiformi dichotomâ fastigiatâ ; dichotomiarum angulis acutis ; apicibus feminiferis lineari-lanceolatis teretibus.—Buddle, p. 11. n. 1.—Petiver, p. 31. n. 5, 8.—Micheli's Marine Plants, t. 43.—Gmelin, p. 108. t. 6. f. 2.—E. B. t. 824.—Linn. Transf. iii. p. 204. Fucus fastigiatus.—With. iv. p. 110.—\* Linn. Transf. iii. p. 199?—Ner. Brit. p. 15. t. 6. (quoad fig. maj.)—Vellay, t. 4. .... caprinus.—Fl. Norv. i. p. 96. .... furcellatus.—Sp. Pl. p. 1631?—Fl. Ang. p. 589.—Fl. Scot. p. 932.—Esper, p. 86. t. 41. —Fl. Dan. t. 419.—Roth, Fl. Germ. iii. p. 456.—Fl. Norv. ii. p. 78.

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\* From the reference to the figure in the Flora Danica, t. 393, this probably rather belongs to the second variety.



*Fucus parvus* segmentis prælongis teretibus acutis.

—Morif. Hist. Ox. iii. p. 648. s. 15. t. 9. f. 4.

—R. Syn. p. 45. n. 24.

β. apicibus ovato-lanceolatis compressis sub-dian-  
phanis acutis brevibus.

*Fucus fastigiatus*.—Fl. Ang. p. 588.—Fl. Scot.

p. 930.—Gmelin, p. 106. t. 6. f. 1.—Fl. Dan.

t. 393.—Roth, Fl. Germ. iii. p. 455.

..... five alga exigua dichotomos, foliorum seg-  
mentis longiusculis crassis et subrotundis.—

R. Syn. p. 45. n. 25.

..... palmaris tenuis in orbem expansus in seg-  
menta bifida vel trifida breviora teretia divisus.

—Morif. Hist. Ox. iii. p. 649. s. 15. t. 9. f. 9.

Common upon almost all parts of the British  
coast.

Perennial—November—February.

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Root composed of numerous, thin fibres, serving both to fix the plant to its native place of growth, and to supply a profusion of fronds, which rise to the height of six or eight inches; cylindrical, of the thickness of twine, filiform, and repeatedly dichotomous at uncertain distances with branches all nearly of the same length, ending, when barren, in short, blunt, pale-red, bifid,

sub-incurved apices; but, when in fruit, in linearilanceolate, cylindrical, binate pods, often an inch long, full of a mucilaginous matter, among which the seeds lie dispersed without order, visible, in the fresh plant, even to the naked eye, if exposed to a strong light. These pods are very opaque, and perfectly smooth, not furnished with perforated tubercles whereby the seeds escape, as is the case in *F. tuberculatus*, and most other species; but after fructification they turn to a mere mucilage, and drop off, so that the plant in February and March is completely truncated, and in general as regularly so, as if the ends had been laid together, and chopped off at one blow with a knife: new branches, considerably more narrow than the rest of the frond, afterwards shoot from the center of the summits, which necessarily causes the annular appearance, on which the variety β of the Linn. Transf. depends. Substance cartilaginous; colour reddish brown, more diaphanous in a recent state than either *F. rotundus* or *tuberculatus*, but turning to an unvaried black after it is dried; changing in decay to grass-green, and white. While lying on the beach I have sometimes perceived from it an extremely faint smell, yet not unlike that of violets.

β , instead of being furnished with long, linear-

lanceolate terminations to its shoots, as is the case in α , has its apices very short, diaphanous, of an ovate, or ovato-lanceolate form, compressed, and of a pale-pink colour: in all other points they entirely agree.



What is said in the above description respecting the annular appearance of this Fucus is the result of repeated and attentive observation; and, if the cause assigned be true, as I have every reason to believe it is, there can be no occasion to urge any thing farther upon this contested subject. I may, however, be allowed to add that, in case I am right in my conjecture, these rings will enable us nearly to judge what increase in length the plant derives every year, and this I am inclined to think is about two inches. I speak with doubt on this head, because, after some time, the new branches become equal in thickness and substance to the old ones, when of course all annular appearance is done away; or otherwise we might exactly ascertain the age of every individual: possibly too, but this must be left to those botanists who can watch it in its place of growth, the fronds are deciduous every year, in which case, there being more than one ring on the same branch must origi-

nate from some injury. Still this, however, is mere conjecture: nor should I have hazarded it were not the growth of Fuci in general so rapid that it is hardly probable any species should increase so little as two inches annually. What appears to me the most remarkable and inexplicable circumstance in this plant is the short, ovato-lanceolate tips, on account of which, Hudson, Gmelin, and other authors have divided it into two species; a separation that cannot possibly hold good, as * Mr. Woodward has a specimen in which the long pods of their furcellatus also originate from the same root. I have repeatedly examined these without detecting in their interior part any different formation from the rest of the frond; and yet their singular shape, their regular appearance at the period of fructifying, their gela-

* I must confess that I had always thought it perfectly easy to find the same thing; but, after examining many hundreds this winter, I am at last disappointed, and obliged to own that what I had taken for the ovato-lanceolate apices of Gmelin's fastigiatus were only the young, barren tips of lumbricalis, which are of the same pink colour, but quite cylindrical and blunt.

tinous texture, and, above all, their being apparently divided from the branches by a dissepiment similar to those of *Confervæ*, visible only in the recent plant, forbid the idea that nature formed them without some useful end in view; and no *Fucus* has ever tended half so much to draw me to the opinion that a dioicous fructification may possibly obtain in some of these vegetables: till, however, more is known of their nature, it seemed to me best to insert the plant as a variety. Mr. Dillwyn found some curious specimens of this *Fucus* at Dover, provided with small, globular, lateral tubercles, very nearly resembling the capsules of *F. confervoides*, which seemed at once to destroy all former opinions on the subject; but that gentleman, with the candour and zeal that he eminently possesses, continued his investigations, till he discovered that these supposed semiferous tubercles were like those of *F. subfuscus*, unconnected with the fructification, and most probably the result of accident. Sufficient has been said under the two preceding species upon the differences of these three so nearly-related *Fuci*; and it has there been shewn, at least upon the authority of Linnæus' Herbarium, that this is not the *F. fastigiatus* of the *Sp. Pl.* I cannot, however, but differ from most other botanists in

believing the variety β to be what he really designed for his *F. furcellatus*; under which name in his collection are preserved three specimens; one a new species from the Mediterranean, that I hope soon to have the pleasure of describing; the other two also new, but much mutilated, and too imperfect to be relied upon. Not one of them agrees with the description in the *Sp. Pl.*, which well suits our plant, and where it is evident that his great reliance is on Morison's excellent figure above quoted: afterwards, in his second Mantissa, he referred to Gunner's *caprinus*, and Gmelin's *lumbricalis*, which last is equally clear; but, probably upon the authority of the first specimen just mentioned, he added the mistaken remark that the colour is often red.

60.—FUCUS PLICATUS.

F. fronde cartilagineo-corneâ filiformi æquali ramosissimâ; ramulis sub-secundis implicatis confertissimis: tuberculis lateralibus terminalibusque.—Buddle, p. 11. n. 3, 4, 5.—Petiver,

p. 27. n. 1, 2, 5.—Uvedale, supplement, p. 77.
 n. 4, 7.—Gmelin, p. 142. t. 14. f. 2.—Fl.
 Ang. p. 589.—With. iv. p. 114.—Fl. Scot.
 p. 929.—Ner. Brit. p. 23. t. 7.—Linn. Transf.
 iii. p. 228.—Fl. Dan. t. 408.

Ceranium plicatum.—Roth, Fl. Germ. iii. p. 459.

*Fucus trichoides nostras aurei coloris ramulorum
 apicibus furcatis*.—R. Syn. p. 45. n. 26.—

Morif. Hist. Ox. iii. p. 649. n. 10.

..... *coralloides erectus*.—R. Syn. p. 51. n. 57.

Morif. Hist. Ox. iii. p. 649. n. 8.

β. fronde sub-fastigiata sub-dichotoma.

Fucus longissimus.—Esper, p. 44. t. 20. (excl.
 fyn.)

Common on the British coast.

Perennial—October—April.

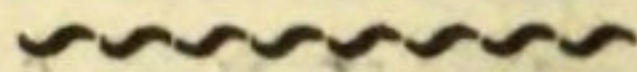


Root a small disk ; fronds numerous, filiform, cylindrical, sometimes, but not often, reaching half a foot in length ; not thicker than thread, and of equal size throughout ; divided near the base into many long, entangled branches, so thickly set with ramuli, and so completely interwoven, that the mode of ramification, which is extremely irregular, cannot be discovered except

by tearing them asunder. Ramuli most frequently disposed only on one side of the branches; those towards the lower part of them horizontal, and distant; gradually becoming clustered and patent as they approach the summits; generally simple at their extremities, but sometimes bifurcate, the ends always very blunt, except when the seminiferous tubercles grow on, and give them a pointed appearance. The fructification consists of minute, opaque, dark-coloured tubercles, with uneven surfaces, plentifully scattered over all parts of the frond, as well near the root as the summits; of no regular shape, sometimes subglobose, but generally truncated, and often indented or concave at their points, so as to resemble the scutellæ of *Lichen gelatinatus* With. in miniature: they are also found on the ends of the branches, and from their blackish hue make them look like hair singed by the fire. From their extreme minuteness they are easily overlooked; and it is probably owing to the same cause I have never been able to discover any traces of seeds in them. The substance of the whole plant is wiry, and rather horny than cartilaginous; flexible when moist, but extremely stiff after it is dried. Deep purple appears to be its true colour, because the plant is generally found so near the base, and the

ends of the branches, being most exposed to the air, are always the first to fade; but, if so, the tint must be more fugitive than is usual in other species, and it varies to pale pink, deep yellow, purplish brown, and pure white, but is always sub-diaphanous, except in the tubercles.

β is of taller growth, and remarkable for its ramification being almost regularly dichotomous, and the branches of nearly equal length



That this *Fucus*, though unnoticed by Linnæus, was not wholly unknown to him, is clear from there being two specimens of it in his Herbarium, sent by König, and marked by himself, *F. fastigiatus*: with some appearances of which species, especially at the ends of the branches, the present, at least its variety β , has a closer affinity than most botanists, who have seen but little of it, would be ready to allow: still, however, it may be reckoned among the number of those which there is least fear of confounding; and Linnæus' error certainly arose from having met with it only in a dry state, and from his specimens being so badly expanded, that the mode of ramification cannot possibly be discovered. Professor Esper's *F. plicatus*, tab. 37. is a very different plant, and one which appears to

be hitherto unknown in Britain: it is singular on account of the branches being every where covered with small bladders, which made him justly suspect that it could not be the same as Gmelin's plicatus, though, from other circumstances agreeing, he did not venture upon making it a distinct species. That his *F. longissimus* is the variety β of this work, which differs only in its ramification, there cannot be the smallest doubt; for, though his figure is gigantic, it is nevertheless very characteristic; and, were there any hesitation, I have specimens from himself that would remove it. The most evident marks of this species, which will always serve to distinguish it from all its congeners, are its wiry substance, its frond of equal size from base to summit, its entangled growth, and, above all, its singular mode of ramification, the lower branches being horizontal and distant, the upper ones erect, crowded, and forked. Its closest affinity is with the smallest varieties of the following species, but the characters just mentioned will be always found sufficient to distinguish it, as well from that, as from every other of British growth. From the bushy habit of its frond above, it is generally broken off by the waves, and its root is left adhering to the rocks, so that but few botanists have seen this part of it,

which is described here on the authority of specimens gathered in a growing state on the rocks at Sheringham, in Norfolk.

61.—FUCUS CONFERVOIDES.

- F. fronde filiformi ramosissimâ; ramis ramulisque sub-secundis utrinque attenuatis; tuberculis hemisphæricis lateralibus sessilibus.*—Herb. Linn.—Buddle, p. 16. n. 1, 2, 4.—Petiver, p. 30. n. 1.—Micheli's Marine Plants, t. 30. n. 1.—Act. Gall. 1712. p. 40. pl. 5. f. 9.—Sp. Pl. p. 1629.—Linn. Transf. iii. p. 208.—Ner Brit. p. 96. t. 15.—With. iv. p. 114.
- Fucus longissimus.*—Gmelin, p. 134. t. 13.
- *verrucosus.*—Fl. Ang. p. 588.—Ner. Brit. p. 27. t. 8.
- *flagellaris.*—Esper, p. 193. t. 105.
- *marinus purpurascens parvus caule et ramulis seu foliolis teretibus.*—R. Syn. p. 50. n. 50.
- β. *procerrimus*—ramis in longissimum protensis sub-simplicibus subnudis.—Micheli's Marine Plants, t. 30. n. 2.

Fucus procerrimus.—Esper, p. 133. t. 92.

..... *longissimus*.—Wulfen in Jacq. Coll. i.
p. 361.—Ner. Brit. p. 99. t. 16

Ceramium longissimum.—Roth, Fl. Germ. iii.
p. 460. (excl. syn. Fl. Dan.)

Fucus teres rubens minus ramosus in longum pro-
tensus.—R. Syn. p. 51. n. 53.

..... *five Alga lenta capillacea pallida, flagellis*
ramosis chordas musicas referentibus.—Moris.
Hist. Ox. iii. p. 649. n. 11.

γ. *implexus*—fronde *implicatâ*; ramis ramulisque
numerossimis confertis contortis.

δ. *gracilis*—fronde *filiformi confertim prode-*
unte: fructu *lateralis glomerato minuto juxta*
apices.

Fucus gracilis.—Ner. Brit. p. 100. t. 16.

ε. *albidus*—fronde *sub-compressâ sub-dichotomâ,*
ramulis subulatis.

Fucus albidus.—Fl. Ang. p. 588. (excl. syn. Raii.)

—Esper, p. 147. t. 100. Linn. Transf. iii.
p. 210. With. iv. p. 118.

..... *verrucosus*. Gmelin, p. 136. t. 14. f. 1.

Ceramiantemo ramosissimo, basso, transparente,
rosso.—Donati, p. 28. t. 1.

* is not uncommonly met with on most parts of
the British coast; γ at Yarmouth, frequent;

β , δ , and ϵ in Dorsetshire, Devonshire, and Cornwall.

Perennial?—September—December.

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Root flat and solid, common to numerous fronds, about the thickness of small twine, of very uncertain length; from six inches, its most general appearance, to near two feet; cylindrical, filiform, branched in a most irregular manner; sometimes being undivided to some distance from the root, and then furnished with a few distichous shoots, all of almost equal length, sometimes almost entirely naked on one side, and plentifully clothed on the other; in either case the branches long, attenuated at their insertion, and gradually tapering to a very sharp point at their extremities; frequently simple, and seldom more than twice or thrice dichotomous; furnished with a greater or less proportion of setaceous ramuli, scattered about, and either attached almost exclusively to only one side, or placed in small, sub-alternate parcels, attenuated at each extremity like the branches, and shooting out from them in a direction between horizontal and patent, mostly simple, though sometimes more than two inches long. The fruit lies in smooth tubercles, about the size



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of small turnip-seed, but varying in that respect; at first hemispherical, or slightly pointed, gradually becoming more mammiform, till in maturity their summits burst, and they are afterwards either urceolate, or scutelliform, like the shields of crustaceous Lichens. The substance of the plant is cartilaginous; its colour dark purple, turning in decay to transparent white.

β is divided from the base into several very long shoots, either quite simple, or not more than twice or thrice dichotomous towards their extremities; in general wholly naked, except near their root, where they are furnished with a few, extremely short, horizontal, setaceous ramuli.

γ is always so entangled, that it is difficult to separate the branches, which are extremely numerous and clustered: the whole plant is remarkably contorted; the ramuli long, and often producing smaller ones; the substance of the frond more tender than in the other varieties: the colour pale red, turning in decay to dirty orange.

δ, which is taken up entirely on the authority of Mr. Stackhouse, is a slender plant, much branched, and sending out numerous shoots from a spreading base: its fructification consists of very minute, lateral tubercles near the summits. Its great difference seems to depend upon its smaller size.



ε, instead of being narrow and filiform, is broader than all the other varieties; rather compressed than cylindrical; its mode of ramification is sub-dichotomous, and both its branches and ramuli are larger at their insertion than in any other part, and taper regularly to their apices.



The list of British Fuci, at the same time that it furnishes instances of many more variable species, hardly contains a single one, in which the different appearances pass more insensibly into each other than in the present, although fortunately they are of such a nature that they cannot easily be confounded with any of their congeners. I would willingly have followed the example of Hudson, Gmelin, and the authors of "Observations on the British Fuci", by dividing it into two distinct plants, could I have found marks sufficient, in my own opinion, to justify me for so doing: the length as well as the ramification of the frond is unquestionably subject to great variation; and the shape of the tubercles in their different stages is no less dissimilar. Gmelin's figures certainly represent two plants at first sight very distinct; but it must be remembered that they represent the two extreme varieties; and any



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botanist, who takes the trouble to compare his descriptions, will, I think, agree with, me that they may or may not have been designed for varying appearances of one species. The same remark holds good with respect to Hudson; but in the Linnæan Transactions it is far otherwise, for the characters of each are there well contrasted, and it is only to be regretted that there is reason to suspect they are not permanent. The matter at all events is doubtful, and the majority of voices so much against me, that I request the case may still be considered in suspense, and remaining to be settled by future investigation. The leading marks of distinction in this Fucus must be considered to depend upon the numerous lateral tubercles, and the short, setaceous ramuli scattered over the branches, the bases of which, at their insertion, are so much attenuated, and so apt to lose their colour, that in a recent state it often appears very nearly allied to *F. dasyphyllus* and *tenuissimus*. from which, in ramification and substance, it is for the most part so far removed. Professor Esper's *F. procerrimus*, the variety  $\beta$  of this work, may probably be essentially distinct, and is almost equally different in habit from this and the following species; retaining at the same time all the strongest peculiarities of the present.



The only British specimen I was ever fortunate enough to see of it was given me by Colonel Velley, and unluckily has no fruit; nor is there any upon what has been sent me by Dr. Esper, gathered at Trieste; we are therefore entirely left to his figure, in which the tubercles are not drawn with sufficient niceness to be determined upon. In his *F. confervoides* the seed-vessels are all flat at their apices, and slightly pedunculate; the habit of the plant much divaricated, and the frond swollen at the divisions, so that I held it safest not to quote it as a synonym. Baron Wulfen's *F. confervoides*, figured in the third volume of Jacquin's *Collectanea*, is the same plant. The third variety above distinguished does not seem to have been remarked by any author, but is the appearance under which the plant is most commonly found at Yarmouth, where it often lies in considerable quantity on the beach, and looks as if it had been purposely coiled up and entangled. Its fructification is not yet discovered, and its root is remarkably small, producing only a single frond. It is not, therefore, impossible it may prove a distinct species. Specimens of *F. confervoides* are occasionally met with of a very dwarfish size, which, from exposure to the sun, have acquired the sub-diaphanous yellowish tint, and wiry sub-



stance of plicatus; but these two species may always be distinguished by their ramification. The difference of the present from *F. flagelliformis*, with which it is still more nearly allied, is pointed out under that plant. The varying forms of its tubercles are well figured by Donati; but, besides these, I once observed at Cromer a singular *lusus naturæ* in a specimen, all the capsules of which were of their natural shape, except one, which was much elongated, and in form resembled a pear.

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## 62.—FUCUS FLAGELLIFORMIS.

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*F. fronde filiformi lubricâ ramosâ; ramis distichis sub-alternis in longum protensis sub-simplicibus nudis truncatis.*—*Fl. Dan.* t. 650.—*Fl. Scot.* p. 928. (excl. syn. Gmel.)

On the rocks at Cromer, in Norfolk: North Wales, Rev. H. Davies.

Annual.?

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Root solid, small; fronds filiform, cylindrical, numerous, above a foot long, and about the thickness of small fiddle-strings; rising with stems, closely set, particularly near the base, with branches, disposed in two rows, and most frequently alternate; undivided for three or four inches, then either suddenly ceasing, as if purposely cut off, or becoming furcate, and ending in shoots like those which clothe its sides: branches all very long, and in general quite simple, but sometimes twice or thrice dichotomous with roundish angles; slightly tapering at their insertion, but afterwards remarkable for their cylindricity, and even size throughout, which they preserve to the extremities, where they terminate quite bluntly. They are wholly destitute of the setaceous ramuli that constitute the principal character of *F. confervoides*. Whole plant slippery, and covered with a slimy mucus, as is the case with *F. filum*, giving it, when viewed fresh in water, a woolly appearance. Substance soft and flexible: colour dark olive-green, apparently black, unless held up to the light: the same recent as dry. I have never seen it in decay.





It must be allowed to be singular that this *Fucus*, though by no means uncommon on our shores, should have escaped the notice of all British authors, except Mr. Lightfoot, who evidently confounded it with *F. confervoides*, as is clear from his quoting Gmelin's plate of *F. longissimus*, and from some parts of his description, which, being manifestly drawn up from two very different species, must not be read without caution. The author of the *Flora Danica*, on the contrary, seems to have been well acquainted with it; and his figure is extremely characteristic, except the small fasciculi attached to the branches, which in all probability are mere casual parasites. The *Fucus flagelliformis* is about equally removed from *F. confervoides*  $\beta$ , and *F. filum*; its mode of ramification connecting it with the first, and its substance with the second: it has no affinity with any of the other varieties of this latter species. By a slight attention to its colour, it cannot fail of being distinguished, as well as by its slimy exterior, but above all by its rising with a short stem, and producing so many long, almost simple branches, ending obtusely, and quite destitute of setaceous ramuli, bearing in this respect, to borrow an expression from Mr. Stackhouse, a striking resemblance to a Roman flagellum. This gentleman



evidently knew it, but does not seem to have considered it sufficiently distinct from his *F. longissimus*. I never heard of its being discovered with any tendency to fructification, and indeed I have seen it in collections arranged among the *Ulvæ*, to which I should not wonder if it were hereafter found to belong. In a large specimen now before me, sent from North Wales by the Rev. Hugh Davies, there are a few tubercular appearances, but so few, and so different in shape, that they are in all probability only the ends of broken branches. This plant, in decay, follows the singular manner of *F. filum*; a particular account of which is given under that species.

### 63.—FUCUS FILUM.

*F. frondē lubricā sub-cartilagineā filiformi simplici utrinque attenuatā tubulosā intus sub-geniculatā.*—Herb. Linn.—Buddle, p. 24. n. 2.—Uvedale, p. 6. n. 4.—Sp. Pl. p. 1631.—Fl. Dan. t. 821.—Linn. Transf. iii. p. 194.—Fl. Ang. p. 587.—Fl. Scot. p. 963.—Ner. Brit.



p. 40. t. 10.—With. iv. p. 108.—Fl. Suec.  
p. 432.—Fl. Lapp. p. 363.—Fl. Norv. ii.  
p. 10.—Gmelin, p. 131.

*Fucus tendo*.—Esper, p. 47. t. 22.

..... *filiformis*.—Fl. Fr. i. p. 97.

*Ceramium filum*.—Roth, Fl. Germ. iii. p. 478.

—Cat. Bot. i. p. 147. n. 1.

*Fucus chordam referens teres prælongus*.—

R. Syn. p. 40. n. 3.

Common on most parts of the British coast.

Annual.?

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From a minute, discoid, and almost conical root, arises a filiform, and generally solitary frond, which often runs to the surprising length of five yards or more; hardly larger than thread at its base, whence it gradually increases in thickness, and attains about the size of a crow's quill, which it preserves till it approaches the apex, and then, again tapering, ends in an acuminate point. It is hollow throughout, and, though quite even in its surface, if held between the eye and light, appears to be evidently jointed within like some *Confervæ*, but dissection in a fresh specimen proves that, instead of being furnished with real *dissepimenta*, it has only what seem to be rudi-

ments of them; or, to speak more correctly, rings in the interior substance of the tube. It often, also, exhibits a spiral appearance. Examined in a recent state, its substance is sub-cartilaginous, slippery, as if covered with a slimy mucus, and remarkably elastic; but it soon loses this latter property after it is cast on the beach, and becomes extremely flaccid: when dry it is somewhat brittle. Its colour is an opaque, brownish green, which, from exposure to the air, turns to yellowish or white; in a dried state to black.

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The fructification of this species not being at present clearly known, its place in the system cannot be considered as altogether settled; but it must be regarded as a curious plant, from its uniting with the texture of a Fucus, the diaphragms of a Conferva, and the simple structure of an Ulva. Dr. Roth, relying upon a single specimen which he found with its apex swollen, most probably from accident, has looked upon himself as having discovered the fruit, and referred it to the genus Ceramium; but we may be allowed in this instance to differ from that eminent botanist, or at least to suspend our judgment till future observations confirm his discovery. Mr. Stackhouse, in his second fasciculus, has particularly remarked the



spiral mode of growth, which about the same time was also pointed out to me by Mr. Dillwyn. It is a very curious circumstance, well deserving attentive investigation; for the whole plant, if carefully examined, appears composed of two equal strips, coiled spirally round each other, yet so closely united as to be clearly discernible only in those parts where time or accident has separated them. Is it not therefore possible that, as whatever receives life receives at the same moment the seeds of dissolution, so nature, in creating the present species, formed it in this curious manner, that, when its period arrives, the parts, losing their connecting principle, may yield more easily to the impulse of the waves, and, unrolling, turn to decay? Upon the use of the interior annuli, or seeming septa, Dr. Goodenough and Mr. Woodward have observed that, as they do not appear to contain the fructification, they may perhaps be intended only to strengthen the plant, and enable it the better to maintain its round and tubular form: a conjecture that seems highly probable, since, from being destitute of these, the *Ulva fistulosa*, which in other respects it very much resembles, is always found irregularly broken and contracted. It may not be amiss to observe that *F. filum* differs from that plant also in its attenu-



ated apices, and slimy surface: in the latter circumstance, as well as its substance and colour, it agrees with the preceding species, which is even formed in the spiral manner above mentioned; though, from its smaller size, this peculiarity is seldom to be detected. Professor Esper was at infinite pains in attempting to clear the synonymy of this *Fucus* and *F. tendo*, nor ought he to be blamed for the error into which he has unfortunately fallen, as it was hardly to be avoided, except by the opportunity that we in England enjoy of examining the authentic specimens; for Linnæus himself, by referring under *F. filum* in the *Sp. Pl.* to the *Amœnitates Academicæ*, p. 259. t. 3. f. 2, evidently confounded them. It now appears clear that what he designed under the name of *F. tendo*, is in reality an animal substance, commonly used in this country for fishing lines, and known by the name of Indian grass; but Professor Esper's *F. filum* seems to have been copied from the stripped stems of *Tillandsia usneoides*. There can be little doubt but Plukenet's *F. indicus teres setam piscatoriam referens*, and perhaps some other supposed *Fuci* of the older botanists, ought consequently to be expunged from the list of vegetables.





## 64.—FUCUS LYCOPODIODES.\*

F. fronde filiformi ramosâ obtectâ undique fetis;  
ramis sub-simplicibus; fetis apice furcatis  
squamatis.—Herb. Linn.—Syft. Nat. p. 717.  
—Linn. Transf. iii. p. 223.—Fl. Norv. ii. p. 80.  
—With. iv. p. 107.

Fucus Lycopodium.—Ner. Brit. p. 107. t. 17.

Conferva squarrosa.—Fl. Dan. t. 357.—Fl. Norv.  
ii. p. 105.

In the western islands of Scotland, Rev. H.  
Davies.

Perennial.

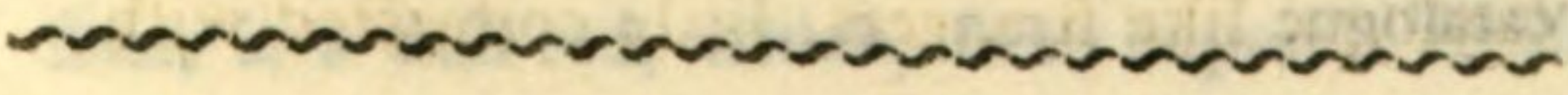
Root a very small callous disk; frond eight or ten inches high, filiform, about the thickness of a crow's quill, and cylindrical; divided into a few long, almost wholly simple branches, all of them entirely covered with closely-imbricated setæ, disposed equally on every side, and pointing in all directions, above a quarter of an inch long, and not subulate or simple as in the following species, but of the same size from base to summit, and generally either forked at their apex, or twice or thrice dichotomously divided; sometimes almost



regularly pinnated. These, seen through a microscope, appear to be jointed, like *Confervæ*, with septa placed at a very short distance from each other. The base of the frond is destitute of them. The fructification of this *Fucus* is unknown, though, from analogy, it may fairly be concluded that it is the same as that of *F. pinastroides*. Its habit is rigid and cartilaginous: its colour, after it is dried, is black; when fresh, most probably a reddish brown; but I have never seen it in that state.

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The connection of the present and following species with the genus *Conferva*, depending not merely on their general habit, in which they are closely allied to *C. verticillata*, *equisetifolia*, &c. but still more strongly upon the jointed appearance of their ramuli, has already been sufficiently pointed out by preceding authors, and makes their place in the system a matter of no small uncertainty. Dismissing, however, this question, which is indeed for the present better dismissed, as no botanist at all acquainted with this tribe of plants can consider their genera yet established upon either a philosophical or durable foundation, it must be allowed that these two *Fuci* stand in the midst of the catalogue like strangers, little connected with

those around them; and, but for their affinity to *F. subfuscus*, as is more particularly mentioned under that species, must justly be considered as forming a separate natural family. In one point of view they manifest a very close connection with *Conferva elongata*, for the dissepimenta that seem to exist in their younger branches are often so faint as to be with difficulty perceived, and never can be discovered in their main stems; nor does the circumstance of the ramuli being jointed create any alteration in their cylindricity. Upon the difference between *F. lycopodioides* and *pinnatroides* enough, it is to be hoped, has been urged in the specific character and description of each to render any further discussion of that point necessary. *F. lycopodioides* is, perhaps, the most rare among the British Fuci, and one of which scarcely any native specimens are known to exist; that from which the above description was made is in the collection of the Rev. H. Davies, to whom I have so repeatedly in the course of this work had occasion to express my obligations. There is another in the possession of Mr. Woodward; and Sir Thomas Frankland told me, some time ago, that he once found a plant of it on the coast of Scarborough.



65.—FUCUS PINASTROIDES.

F. fronde filiformi ramosissimâ obtectâ undique
fetis; ramis apice involutis; fetis sub-secundis
subulatis simplicibus.—Buddle, p. 18. n. 3. and
p. 19. n. 3, 4.—Petiver, p. 40. n. 1, 4.—
Gmelin, p. 127. t. 11. f. 1.—Linn. Transf. iii.
p. 222.—Ner. Brit. p. 74. t. 13.
Fucus incurvus.—Fl. Ang. p. 590.—With. iv.
p. 115.
Pinus maritima five Fucus teres cujus ramuli fetis
fursum tendentibus sunt obfiti.—R. Syn. p. 50.
n. 46.

On the shores of the southern counties of England.
Perennial. ?—November.

Root * solid; frond from six to nine inches
in height, cylindrical, woody, as thick as common

* This is the case in all the specimens that I
have seen; but, both in the Linnæan Transactions
and Nereis Britannica, it is described as fibrous,
and must consequently be considered as liable to
variation.

twine, beset with numerous, long shoots, except towards the base, where, as in most other species, it is almost naked. The stem and branches are on all sides covered with a profusion of subulate, sub-incurved setæ, about half an inch long, entire, pointing upwards, and more to one side than the other, most thickly imbricated, but by no means disposed in any constant order, except in the upper branches, where they grow regularly in pairs, gradually shortening as they approach the apices, and attached to one side only. In these pairs it often happens that one is much less than the other, and in a few cases I have observed three together. The branches are in general once or twice again divided, are all more or less incurved, have their extremities somewhat rolled in, and are jointed, with septa extremely close to each other, far most visible in the youngest shoots, which nevertheless preserve their cylindrical form, and are neither swollen nor contracted on that account. The fruit consists of small, globular tubercles on short peduncles, arranged along the upper side of the setæ, five or six on each. The substance of this Fucus, while fresh, is between cartilaginous and ligneous; it is then very flexible, but becomes stiff and rigid when dry. Its colour, in a recent state, is a dull red, which, from exposure to air,

or being kept in fresh water, soon turns to black, but, even after it has been long dried, may be detected towards the ends of the shoots if held to a strong light, and the septa also are then apparent. The setæ, though described above as simple, seem nevertheless sometimes to lengthen into new branches, and in that case are, as in the preceding species, either forked or sub-pinnated towards the apices; this, however, is not common

In the whole list of British Fuci none seems less liable to variation of appearance than the present; for, excepting that specimens are occasionally found with the setæ longer or shorter, less or more closely imbricated than usual, I never recollect meeting with any that might not be immediately recognised by a person once acquainted with the plant; and yet a botanist, who had only seen it in Herbaria, when from being dry it is become quite rigid, and its colour is an entire black, would have need at least of reflection before he knew it in its native place of growth, where its reddish tint, and flexible substance, are so widely different, and so conspicuous. By an observation of this kind, it is of course not intended to be denied that specimens, in a very early stage, while

the branches yet wear the form only of long, naked setæ, are extremely unlike in habit to those that are thickly covered with ramuli, which, from having been battered by tempests, are every where short and broken off at their points; but these are differences for which all botanists naturally make allowance, as they are observable in every plant, and such as depend, not upon the individual, but upon the very essence of things. Gmelin's figure of this Fucus is far from good, being drawn with the setæ loosely scattered, and in that respect strikingly contradicting his own description, in which he finds fault with Hudson for saying that they are attached chiefly to one side; and observes he never saw the plant otherwise than having both sides loaded with them. That Professor Esper has, under the name of *F. pinastroides*, figured a young specimen of the *F. mucronatus* of this work, as has been mentioned under that plant, is very clear, particularly from the magnified branch, and from his description, wherein he principally aims at distinguishing it from *F. concatenatus*. Respecting the affinity of this singular Fucus with the genus *Conferva*, and the marks that keep it most effectually distinct from *F. lycopodioides*, with which alone there is any chance of its being confounded, enough has already been said in the account of that

species, and in the descriptions of them both. Under *F. subfuscus* has been mentioned the connection that subsists between some specimens of that and the present; a connection of which few botanists are aware; and, considering which, it is remarkable that in the form of their fructification they should be so widely different. The description of this species in Ray's Synopsis is highly characteristic; and Gmelin's name of *pinastroides*, thence most probably derived, is far superior to that of *incurvus*, given it in the *Flora Anglica*.

66.—FUCUS SUBFUSCUS.

F. fronde filiformi ramosissimâ; ramulis sub-alternis subulato-setaceis brevibus: fructu axillari racemoso.—Linn. Transf. i. p. 131. t. 12.—iii. p. 212.—With. iv. p. 116.

Fucus confervoides.—Fl. Ang. p. 591.

..... *variabilis.*—Linn. Transf. iii. p. 220.

Very common on the eastern coast of England.

Perennial—February—May.

Root a broad, expanded, thin, pale-red disk; fronds very numerous, cylindrical, filiform, from three to eight inches high, about the thickness of small twine, naked, or only rough with a few short, sub-setaceous ramuli about the base, afterwards divided into a greater or less number of long shoots, of nearly an equal height, crowded towards the summit of the plant; sometimes disposed without order, but frequently alternate, copiously clothed with others similar to them, except in their smaller size, and these often again and again with others, so as to give the plant, especially towards its extremities, much of a pinnated appearance, which is hardly less remarkable when fresh than after it is dry. The ramuli are short and subulate with acute points, either quite simple, or provided with a few alternate distichous setæ at their ends: patent, frequently fixed only on one side of the branch, not attenuated at the base, and strongly resembling those of *F. pinastroides*, but differing in their smaller size, and in being neither imbricated, nor disposed in pairs. Chiefly from the alæ of these, but occasionally also from their sides, and from those of the upper branches, issues the racemose fructification, consisting of a simple, minute peduncle, scarcely one-fourth of a line long, supporting at its ends about six oblong,

obtusely-pointed, transparent tubercles, of a pale-pink colour, each containing a few round, darkish seeds, disposed in two rows. The fructification, when young, looks like small spots of a gelatinous substance, and cannot, even in maturity, be well seen without a good glass. The substance of the plant is firm and cartilaginous; its colour reddish brown, pale at the extremities; when dried, or kept long in fresh water, turning to black. Such is the general appearance of this very variable *Fucus*; but, besides the real fructification, large, globular, dark-red, or black swellings are often scattered irregularly over the greater as well as the smaller branches; these are solid, with uneven surfaces; of the same substance as the rest of the frond, and probably caused by the puncture of some marine insect; but still, from their similarity to the fruit of other *Fuci*, very apt to mislead. I have also not unfrequently observed them on *Conferva elongata*. In the months of autumn, winter, and spring, *F. subfuscus* has an extremely battered and rough, spinous appearance; its branches are few, their extremities almost uniformly broken off, and the substance of the whole rigid; but, after the time of fructification, whether from the numerous peduncles shooting into ramuli, or from any other cause, a botanist, though well

acquainted with it before, will with difficulty recognise its numerous, fasciculated, almost capillary ramuli, vigorous habit, fastigiated extremities, soft, nearly gelatinous texture, and pale colour, which remains unaltered even after drying.

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That the present is really the *Fucus* intended in the *Flora Anglica* under the name of *confervoides*, I am not only assured by Mr. Davies, but have, through the friendship of that gentleman, received authentic specimens from Mr. Hudson himself, whose description also is extremely characteristic of the plant in some stages of its growth; though, from his having been unacquainted with the fructification, it is necessarily imperfect, and wants that mark on which depends by far the most striking peculiarity of the species. This, being confined exclusively to the earliest months of spring, was never detected, till Mr. Wigg discovered it at Yarmouth, and shortly after Mr. Woodward made it known to the botanical world in the first volume of the *Linnæan Transactions*, giving at the same time a most excellent account of the *Fucus*, under the name of *F. subfuscus*, which appellation has continued to be preserved, without its being once imagined that it was the same as the *F. confervoides* of the *Flora Anglica*,



because its winter and summer appearances are so widely different, that no botanist, who did not enjoy the advantage of examining it at all seasons of the year, could ever suppose them to be the same plant. The tubercles, also, above noticed in the description, from their resemblance to real fructification, probably tended to confirm the error; but it could hardly fail of appearing strange, that a species so common as the present, especially upon the Norfolk shore, where it is even more abundant than *F. coccineus*, should have escaped so acute an observer as Mr. Hudson; and I cannot prevail upon myself to believe that the "*F. teres, rubens, ramosissimus*," of Ray's synopsis, p. 51. n. 52, was not really designed for it, though both Hudson and Gmelin refer that to *F. purpurascens*, and no author has hitherto quoted it as a synonym of *subfuscus*. The name assigned to this species in the *Flora Anglica* being previously occupied by Linnæus, I have consequently retained the more recent one, given it by Mr. Woodward, which also has the additional advantage of being that whereby it is most generally known. In point of fructification no *Fucus* of the same division has hitherto been found to have any affinity with the present; and indeed, of all the British list, *F. natans* and den-



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tatus alone accord with it in this respect, except indeed *Conferva elongata* be allowed a place as the *F. diffusus* of Hudson; but about the fruit of that plant there is much that requires a future and careful investigation. In general habit, structure, and ramification, *F. subfuscus* is almost equally connected with the two between which it is here situated: its luxuriant summer specimens strongly resemble barren plants of *F. purpurascens*, but differ in their colour, their firmer texture, and their almost pinnated ramuli: those individuals, on the other hand, that have sustained the fury of the storms of winter, before they have had time to recruit their mutilated branches, bear a striking similitude to some injured pieces of *F. pinastroides*, as has been previously noticed; and the affinity is considerably increased by a faint appearance of *dissepimenta* being often, but by no means constantly visible in the ramuli. It is always, however, unfair to call upon a botanist to decide on injured and imperfect specimens, even in the plants that are best known; and, if such be the case with respect to the vegetables that we have opportunities of examining daily in their places of growth, it surely cannot be expected that, among the submersed algæ, where so many and so obvious difficulties oppose themselves to our investigation, any

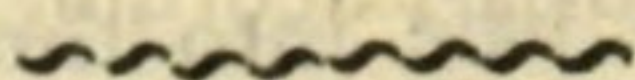


one, however skilful, should venture to give a positive opinion without having perfect plants submitted to his examination. The *F. confervoides* of the *Historia Fucorum*, p. 147. t. 15. f. 2. is evidently a very different plant, though the author of that work refers particularly to the *Flora Anglica*, and seems thence to have taken some part of his description. *F. subfuscus* is occasionally found at Yarmouth with its branches so narrow that it seems almost necessary to separate it into two varieties; and I have received, both from Leith and Weymouth, specimens that I suppose belong to it, in which the shoots are completely capillary: these latter, however, are so very remarkable, that they ought perhaps rather to form a new species, though, never having seen them in a recent state, or in fruit, I would not venture to make them so. Before I dismiss this *Fucus*, I must mention that Mr. Mason has been so kind as to favour me with a specimen of it from the Isle of Wight, the ends of which are tipped with small globules, about the size of turnip-seed, giving the plant the appearance of the male shoots of a *Mnium* in fruit: these seem, under a microscope, to be some clustered *Conferva*, but I cannot satisfy myself fully about them.





## 67.—FUCUS PURPURASCENS.



F. fronde filiformi ramosissimâ; ramulis setaceis  
sparsis: pericarpis sub-globosis gibbosis innatis.—Buddle, p. 16. n. 3. and p. 17. n. 9.  
(bleached)—Micheli's Marine Plants, t. 29.  
(right hand figure.)

F. purpurascens.—Linn. Transf. iii. p. 225.—  
Fl. Ang. p. 589.—With. iv. p. 113.—Velley,  
t. 2.

..... tuberculatus.—Fl. Scot. p. 926.

..... corallinus.—Fl. Dan. t. 709.

..... purpureus.—Gmelin, p. 139.?

..... capillaceus.—Esper, t. 35. (excl. syn.  
Gmel.)

..... teres albus tenuissimè divisus.—R. Syn.  
p. 50. n. 51.—Moris. Hist. Ox. iii. p. 648.  
n. 6.

Common on most parts of the British coasts.

Perennial.



Root an expanded, fleshy disk, throwing out  
several long, thick, incurved, branching fibres,  
which clasp the stones or other substances on



which it grows. Frond filiform, cylindrical, from nine inches to a foot long, preserving throughout a stem either simple or divided at a considerable distance from the base into three or four nearly equal branches, about the thickness of a crow's quill, beset more or less closely with shoots, disposed without order, and of various lengths: these are again clothed in the same manner with fetaceous or subulate ramuli, frequently undivided, but occasionally much branched; acutely pointed, and often forked at their tips; most of them towards their center swollen into tubercles, at first lanceolate, but, as they approach perfection, taking a sub-globose and gibbous form, and when mature often bending the branch on which they grow, so as to give it a geniculate appearance. Two or more of these tubercles are sometimes found on the same ramulus, at a greater or less distance from each other, and disposed in a moniliform manner; occasionally, too, they are confluent, so as to be almost fusiform: their substance is tender; their colour at first an uniform pale pink, in the center of which, as they ripen, orbicular crimson spots are very visible, gradually occupying a greater portion of them, and becoming darker in colour, till, no longer able to contain them, the tubercle bursts laterally, like

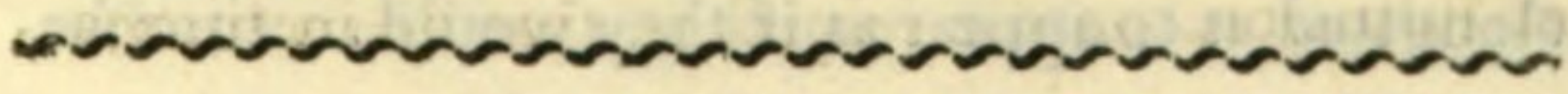


the capsule of a fern, and they escape; after which it assumes a whitish hue, and decays. I never saw any appearance of the seeds attaching themselves to the frond after their dispersion; nor, from its substance, does it appear probable that they do so. If a mature tubercle be cut through, and placed under a good microscope, the crimson globule in the center will be found of a pulpy nature, differing from that of the enclosing coats, and colourless itself, but full of a vast number of minute, dark seeds. The substance of the plant, in its perfect stage of growth, is cartilaginous, but gelatinous while young: it is always succulent and tender. The colour of the main stem is a dark, reddish brown, more pale and diaphanous in the finer branches; always with a purple hue, and frequently throughout tinged with light green, to which it turns in decay. This species is particularly liable to be infested in October and November with a minute, dark-green *Conferva*, the same, most probably, as is described and figured in Dillenius, p. 552. t. 85. n. 21, under the name of "*Conferva upon Conferva*."

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This *Fucus*, so different from every other British species, by reason of the peculiarity of its fructification, and so easily known in that state, is

generally recognised with difficulty, and often the cause of considerable perplexity when found previous to the appearance of its tubercles. In such case, the most ready and certain mark to distinguish it from *F. subfuscus*, with which it has most affinity, consists in the incurved fibres of the root, which are wholly wanting in that species: it may also be known by its more gelatinous substance, by the thickness of the leading stem, compared with that of the rest of the frond, and by the terminating branches being simple, or furnished only with a few scattered ramuli, instead of being sub-pinnate. That the *F. corallinus* Fl. Dan. t. 709, which I have ventured to adduce as a synonym, as was first suggested to me by Mr. Woodward, really belongs to this species, appears to me to admit of no question, although the alternate situation of the branches, which is made to constitute a part of the specific character, certainly does not always hold good, and the tubercles are far more regularly confluent than in any specimen that ever fell under my observation. Gmelin's *F. purpureus* does not appear by any means an equally certain synonym; the swelled apices, and property of giving out a purple dye, are sufficient to make it doubtful: but what leads me to harbour still further suspicions on the subject is, that he mentions

the Mediterranean as its habitat; and Professor Esper, in his *Icones*, t. 58, figures, under the same name, a plant gathered near Paulippo, which far better accords with his description. If, however, this be not our *F. purpurascens*, it seems evident that no mention is made of it in the *Historia Fucorum*; and it is hardly probable that so common a species should have entirely escaped the author of that work. Esper's figure and account of *F. capillaceus*, t. 35, quoted above, especially the magnified branch, so entirely suits the present plant, that, though I have not yet received specimens from the learned Professor to prove the identity, I feel no hesitation about it; there can, however, be little doubt but that the reference to Gmelin's *Fucus* of the same name, which, as has been previously stated in this work, most probably belongs to one of the varieties of *F. corneus*, must be excluded. I have followed Dr. Goodenough and Mr. Woodward, in opposition to Mr. Hudson, in quoting Ray's n. 51, because the observation in the Synopsis that "*crebris sæpe nodulis donatur, quæ non ad latus hærent, sed ab ipsis cauliculis transadiguntur*" is highly characteristic of the fruit of this species, but could not be applied to that of any other.



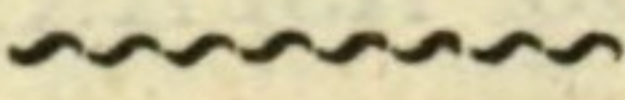
68.—FUCUS WIGGHII.

F. fronde filiformi sub-gelatinosâ ramosissimâ; ramulis setaceis sub-simplicibus sparsis apice capsuliferis; capsulis lanceolatis mucronatis.—
Linn. Transf. vi. t. 11.

Among the rejectamenta of the sea at Yarmouth.
Annual—July.

Root a minute, blackish callus; frond cylindrical, filiform, about the thickness of packthread, from three to six inches high, divided, immediately adjoining its base, into branches of considerable but uncertain lengths, which are again beset with others, arranged in general alternately, though by no means certainly so, and giving the frond, in some measure, a pinnated appearance. All these, the large as well as small, are clothed with minute setæ, or ramuli, scattered without order at short intervals from each other; in general about a line long, and simple; sometimes, however, once or even twice forked, and so much elongated as to appear as if they would in time be-

come new branches. These setæ perform the office of peduncles, and support at their apices lanceolate or ovato-lanceolate pods, terminated by a sharp point, and too small to be easily visible to the naked eye, but, under the microscope, evidently full of seeds. The substance is between cartilaginous and gelatinous, extremely tender; the colour a very pale, sub-diaphanous rose-red.



The few specimens hitherto known to exist of this delicate *Fucus* have all been gathered on the shore at Yarmouth, so that its place of growth still remains a matter of uncertainty. The honour of first discovering it belongs to Mr. Wigg, whose name it bears. In size, substance, and colour, after it is dried, its affinity with *F. asparagoides* is considerably great; but the different disposition both of its branches and setæ, and, above all, the dissimilar shape of its fruit will always be sufficient to keep them at first sight separate. In the latter of these circumstances it agrees much with *F. purpurascens*, and I have therefore here placed it between those two *Fuci*, and have also altered the terms of the specific character, given it in the *Linnæan Transactions*, to make it better accord with that of its congeners. Indeed I fear that I

have in that work improperly used the word setaceous, intending it to convey the idea of the branches being covered with setæ, not of their being themselves bristle-shaped.

69.—FUCUS ASPARAGOIDES.

F. fronde filiformi sub-gelatinosâ ramosissimâ, ramulis subulato-setaceis oppositis apice alternatim tuberculiferis; tuberculis globosis.—Linn. Transf. ii. p. 29. t. 6. and iii. p. 214.—E. B. t. 571.—With. iv. p. 117.

On the rocks at Cromer, Norfolk; among the rejectamenta of the sea at Yarmouth.

Annual—June—September.

Root a small, almost globular callus, producing one, two, or three filiform, cylindrical fronds, of uniform substance throughout; six or eight inches high, and about the thickness of packthread, frequently and irregularly divided into numerous

long branches, which are either simple, or again furnished with others in a sub-alternate series. These latter are scarcely ever farther divided, but are clothed throughout their whole length with opposite, subulate, setaceous ramuli, not larger than hair, between patent and horizontal, and about two lines long, and one from each other. Every other of these is in general not more than half the length of the rest, and bears at its apex a minute, globular capsule, smaller than poppy-seed, in the center of which, if examined with a good glass, may be discovered five or six oblong, dark-coloured grains. Sometimes, however, the number of capsuliferous is very small, compared to that of the barren ramuli; but it always happens that every one of the former is placed opposite to one of the latter. The substance of this Fucus is sub-gelatinous, and extremely tender; its colour, when recent, a most beautiful sub-diaphanous crimson, very fugitive.



Mr. Wigg was the first discoverer of this highly elegant algæ among the rejectamenta of the sea on the Yarmouth beach, and many years ago made it known to Mr. Woodward, who, in the second volume of the Linnæan Transactions,

favoured the botanical world with an admirable account and description of it; since which time he has himself detected it in its place of growth on the rocky shore of Cromer. For beauty of colour it rivals, if not exceeds, any other species of British origin; but this can only be known to those who have opportunities of seeing it while perfectly recent, as, whatever care may be employed in the preservation of it, the bright, glossy tinge will fade; and though, if well expanded, scarcely any Fucus is more beautiful on paper, it is nevertheless in that state far inferior to what it was before it was dried. When washed by the sea upon the shore it looks like a shapeless, gelatinous mass, so that it may most easily be passed over by botanists not accustomed to these plants, and that circumstance, added to its rarity, will satisfactorily account for its having remained so long unnoticed. The preceding is the species with which it has the closest affinity; but this affinity exists chiefly in general habit; for both their colour, the shape of their capsules, and their ramification are very dissimilar. There is no other Fucus for which it can well be mistaken.

70.—FUCUS PEDUNCULATUS.*

F. fronde filiformi pinnato-ramosâ; ramis capillaceis: tuberculis obovatis sub-pedunculatis apice filamentosis.—*Fl. Ang.* p. 587.—*Linn. Transf.* iii. p. 213.—*E. B.* t. 545.—*With.* iv. p. 120.—*Ner. Brit.* p. 110. t. 16.

Fucus Gærtnera.—*Gmelin*, p. 164. t. 19.

On the rocks at Portland Island, Mr. Hudson;
among the rejectamenta of the sea at Yarmouth
and Cromer, in Norfolk.

Annual.

Root a very minute, blackish, almost globular callus; frond in general solitary, composed of a cylindrical, filiform stem, not much thicker than common thread, but extending to a foot, or even more, in height; pinnated from base to summit with a series of capillary, sub-distichous branches, whereof those in the center are longest, and the upper ones by far shortest, so that the outline of the frond is in a measure ovate. They are disposed in an irregularly alternate order, and always undi-

vided, but clothed throughout at short distances with minute, obovate, or oblong tubercles, crowned at their apices with a tuft of pale-green, silky filaments, often twice their length, very deciduous in case of injury, so that specimens may occasionally be found in which they are altogether wanting, and appearing under a microscope faintly jointed. The tubercles are supported upon small, simple peduncles, in general about as long as themselves, but sometimes far exceeding them in that respect, and not unfrequently wholly wanting. Their appearance has been admirably compared by Gmelin to the slender capsules of an Hypnum; and when highly magnified they may also not inaptly be assimilated to that of some species of marine Hydræ. The substance of the whole plant is cartilaginous; its colour a pale, brownish, sub-diaphanous yellow.

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The long, undivided, capillary branches, beset with pedunculated tubercles, will always serve to keep the present Fucus effectually distinct from every other British species; but its most striking character depends upon the pencils of pale-green filaments, with which the peduncles are tufted, and which add extremely to the beauty of the



plant, though for the office they are destined to perform in its œconomy, no satisfactory conjecture has ever yet been alledged. The most generally received opinion seems to be that they are a parasitic *Conferva*, and this receives apparent confirmation from their being jointed; a circumstance that precludes the possibility of supposing them designed to furnish a viviparous offspring, but one, which at the same time is surely destroyed from their being present on every perfect specimen of the *Fucus*, and from their being attached to the apex of every tubercle, yet to no other part of the frond; add to this they are equally constant on *Conferva villosa*, a plant in habit and substance remarkably allied to *F. pedunculatus*: from which considerations it has always struck me as most probable that their nature is rather analogous to that of the filaments observable on the surface of *F. serratus* and others, and that it is most likely they are vessels provided by nature for the purpose of supplying nutriment to the species. The tubercles on which they are placed, even if examined with a powerful glass, exhibit no appearance of seeds within them, though, from their form and situation there seems little doubt of their being really the organs of fructification, as Hudson and all other writers have regarded them. Gmelin's



figure of his *F. Gærtnera*, in the place above quoted, is so extremely bad, that no botanist, however acquainted with *F. pedunculatus*, would recognise it in that representation; but his description is on the other hand truly characteristic, in so much that I have felt no hesitation in referring to it as a synonym. He has also introduced in his work two other species, which from his account seem most closely allied to the present, and may probably hereafter be found to constitute with it and *Conferva villosa*, a new as well as natural genus: neither of them, however, is known to have been at present found in England.

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#### 71.—FUCUS CAPILLARIS.\*

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*F. fronde filiformi alternatim ramosissimâ; ramulis sub-distichis subulatis brevibus.*—*Fl. Ang.* P. 591.

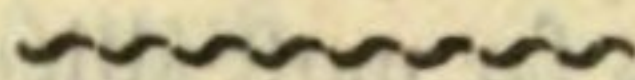
On the rocks near Sheerness; in the Isle of Sheepy; in Devonshire and Cornwall, Mr. Hudson.

Perennial—April—October, Hudson.

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Root a small callus ; fronds numerous, cylindrical, filiform, almost half a foot high, very much branched. Branches capillary, in general alternate, but sometimes scattered, and occasionally opposite ; again and again divided in the same manner, the extreme shoots or ramuli being sub-distichous, subulate, and very short, for the most part arranged at a distance from each other, but occasionally somewhat crowded. The colour of the whole is a purplish red, pale after it is dried. Its substance appears to be tender, and almost gelatinous. Its fruit is unknown.



I have ventured to admit this *Fucus* into the British catalogue, without ever having seen it in a recent state, on the authority of two specimens ; the one from Mr. Hudson himself, communicated to me by the Rev. H. Davies, the other given me some years since by Dr. Goodenough, and named at the back *F. capillaris*, in the hand-writing of Sir Thomas Frankland. I have shewn these specimens to many British botanists, but have met with no one among them, except Mr. Davies, who had ever found any thing similar, so that in all probability the present is one of the most rare of all our *Fuci* ; and the word, *passim*, which is added in the



Flora Anglica to the many habitats above given, ought rather to be considered as a proof of its scarcity than its abundance. My description contains very little that is not exactly borrowed from Hudson, under the conviction that any botanist who writes upon these plants, solely relying on the authority of dried specimens, is far more likely to mislead than to illustrate; and I therefore held it best simply to repeat what had been said by a real observer, than run the risk of rendering obscurity still more obscure, by adding remarks which probably would not apply to the Fucus in its state of nature. The following is the plant to which it seems far most allied, and from which alone there is any need of particularly pointing out its marks of difference: in colour, substance, and, in some degree, mode of growth, they certainly approach each other nearly, but are very unlike in the shape and disposition of their ramuli, which in the one are crowded and sub-clavate, in the other are scattered, and taper to a fine hair-like point.

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72.—FUCUS CLAVELLOSUS.

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F. fronde filiformi sub-gelatinosâ tubulosâ ramossimâ; ramis ramulisque sub-alternis sub-distichis; tuberculis urceolatis axillaribus.—Linn. Transf. vi. t. 10.

℞. sedifolius; ramulis oblongo-ovalibus confertissimis indivisis.

Among the rejectamenta of the sea at Yarmouth, Norfolk.

Annual—July—August.

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Root a very minute, black, callous point; fronds numerous, from four to six inches high, and hardly more thick than small fiddle-strings, cylindrical, tubular, and filiform, but slightly tapering to their extremities, which, though narrow, are somewhat rounded. The usual mode of growth in this plant is with simple or forked stems, pinnated from base to summit with crowded branches of very uncertain lengths, generally disposed in a sub-distichous and irregularly alternate order, sometimes indeed opposite, but never, as far as I have seen, arranged in whorls; these are



again in the same manner clothed with smaller ones, which in their turns bear others still more small. The whole of them are quite cylindrical, and destitute of any tendency to the articulations so remarkable in the following species. The ramuli are either simple, alternate, of a form between cylindrical and clavate, and placed at slight distances from each other, or, as more frequently happens, very much crowded, and irregularly cleft into several segments, in the alæ of which grow the feminiferous tubercles, the shape whereof is either urceolate, or between cordate and triangular; they are of a pale, pellucid colour, except that in their centers lie the seeds, in minute, dark-brown clusters, of uncertain form and size, so closely crowded together as to appear an inseparable mass. The capsules in time fall off, and the seeds adhere like those of an *Ulva*, disposed without order, about the shoots. The colour of this *Fucus* is a pale pink, which changes in decay, or when long exposed to the air, to a whitish green. The substance is very tender, and almost gelatinous.

The ramuli of  $\beta$  are very numerous and clustered; of a form between oblong and oval; and almost always entire.





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For the information that the late Rev. John Lightfoot had known this plant, and intended to have described it as a distinct species under the name above given it, I am indebted to the kindness of Sir Thomas Frankland, who has found it abundantly on the rocks near Scarborough, where, as well as upon the Norfolk coast, this elegant species is far from being uncommon. There are specimens of it also among the relics of Mr. Hudson's collection, in the possession of Mr. E. Forster, jun.; but, as no description in his Flora well accords with it, it is most probable he did not receive them till after the publication of that work. Upon one of these specimens, and a very few others found at Yarmouth, depends the second variety, which, from its ramuli having so striking a resemblance in form to the leaves of *Sedum sexangulare*, as well as some appearances of *F. ovalis*, deserves to be pointed out as distinct, and serves, among a thousand other instances, to shew how constantly the operations of nature baffle the systematic arranger of her works; as though, according to the present distribution, it is necessary to keep these two plants widely removed from each other, still in a dried state, in which alone I have had an opportunity of examining the present, it has no less claim than the other to a place in the



first division. The fate of this *Fucus* has been hitherto peculiarly unfortunate, and the endeavouring to point out its specific character is attended with singular difficulties: all authors upon the subject, with the exception of Mr. Lightfoot, to whom I presume it was not known when he wrote his *Flora*, having considered it only as a varying appearance of *F. kaliformis*, and purposely drawn up their description of that plant, so as to include this also; a circumstance far from surprising, as they are gathered upon different shores, so that few botanists well acquainted with the one, are likely to have seen the other in its place of growth; the *Fucus kaliformis* being principally, if not entirely, confined to the western coast of Great Britain, where I have no reason to believe that *F. clavellosus*, a native of the rocks from Norfolk to Northumberland, ever makes its appearance. As, during the months of summer, this latter is far from uncommon upon the Yarmouth beach, I have had an opportunity of watching it for several years, in the course of which I never, at any period of its growth, remarked a tendency to assume the appearance of the former; but being acquainted with that species only from having seen a few dried specimens, I reserved my opinion till my tour into Cornwall



in the summer of 1799 gave me an opportunity of examining it plentifully in a recent state, and satisfying myself that the plants are even more distinct when fresh than when expanded upon paper, and preserved in Herbaria. The most prominent features of difference between them are the jointed appearance and sub-verticillated disposition of the shoots, especially the extreme ones in *F. kaliformis*, no tendency to which is observable in *F. clavellofus*. The general habit and size are also strikingly dissimilar; but above all, I feel inclined to depend upon the shape and situation of the tubercles, which in the former are lateral and quite globular, but in the latter urceolate and axillary. Both of them approach very closely to the *Ulvæ*, and, if found after their seeds are scattered, might easily be mistaken for belonging to that genus.

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73.—FUCUS KALIFORMIS.

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*F. fronde filiformi sub-gelatinosâ tubulosâ ramossimâ; ramis ramulisque sub-verticillatis arti-*



culato-contractis; tuberculis globosis laterali-  
bus.—Linn. Transf. iii. p. 206. t. 18.—With. iv.  
p. 89.—E. B. t. 640.

*Fucus verticillatus*.—Fl. Scot. p. 962. t. 31.

*Ulva purpurascens*.—Fl. Ang. p. 569.?

$\beta$ . ramulis productis sub-simplicibus, articulis ob-  
foletis.

$\alpha$  is not unfrequent on the Dorsetshire, Devon-  
shire, and Cornish coasts;  $\beta$  is found on the  
western shores of Scotland, Mr. Menzies;  
North Wales, Rev. H. Davies.

Annual—July—August.



Root a small, callous disk, common to two or  
three cylindrical, filiform, tubular fronds, from  
six inches to a foot high, and in their greatest  
thickness about equal to a large crow-quill. The  
stem is undivided, and narrow immediately at the  
base, but soon swells to a size which remains  
nearly uniform throughout, except that it is at  
intervals obsoletely jointed, till, as it approaches  
towards the summit, it begins again to lessen, and  
ends in a narrow, bluntish point. The same is  
the case with the numerous branches with which  
it is surrounded, and which, originating at a few



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lines from the root, continue in a regular series to the extremities, at distances from each other which are somewhat uncertain, but smaller as they draw more near to the top of the plant: their disposition is sometimes opposite, or single, yet generally in whorls each containing three or four. The central ones are for the most part longest, and in this respect often equal or surpass the main stem; the upper ones gradually diminish, and give the plant, when properly expanded, an oval shape: they are in a similar manner provided with others, which also often produce a second series; the extreme ones bear the ramuli, which are almost always simple, subulate, but blunt, and strikingly contracted into short, ovate, or oblong joints. The similar contractions that are observable throughout the whole stem and branches, at the parts whence the whorls of shoots issue, are much more removed from each other; rather of a lanceolate form, and generally very faint. The fructification, which consists of dark-red, or brown globular tubercles, is scattered plentifully over the ramuli. If examined through the microscope it will be seen that the seeds are imbedded in a pale-pink mass, similar to what is observable in the Antheræ of the Charæ, but always, in all stages, spherical, and rather oblate than prolate: when



the capsules die away, the seeds adhere to the frond. The colour of this Fucus is a pale crimson, so fugitive that, unless in gathering the plant care is taken to select specimens that have grown sheltered by the larger Fuci, it is seldom found except of a light yellow, or greenish hue. The substance is tender, and almost gelatinous.

$\beta$  has but few branches, and has ramuli long, generally simple, and so obsoletely jointed, that the contractions are hardly visible.

There appears to me so little doubt of this being the plant designed by Lightfoot, under the name of *F. verticillatus*, that I cannot but consider him as the first writer to whom it was known, and consequently the name which he gave it as having a right to be retained on the score of priority, though, at the same time, all subsequent authors have so unanimously agreed in distinguishing it by the more characteristic denomination of *kaliformis*, that the deviating for once from an established rule, and following their authority, seemed the way best calculated to avoid future confusion. There are two mistakes; the one in the description, the other in the figure of this species in the *Flora Scotica*, that have particularly tended to



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mislead, and consequently require to be noticed; the former is, that the colour of it in that work is stated to be a pale or whitish green, which, as remarked above, is the case only in bleached specimens: the other, of far more consequence, depends upon the ramuli being drawn almost capillary, an error immediately accounted for, upon the supposition that the engraving was made from a specimen dried without sufficient care, in which case, as I know from experience, the extreme shoots wear the appearance that is there given them. The articulations are not represented by any means more strong than they may be seen in many individuals. I have subjoined a mark of doubt to the reference to Hudson's *Ulva purpurascens*, because, though it can hardly be conceived he was so little acquainted with his own plant as not to know whether Lightfoot's figure did or did not belong to it, yet his description, if really intended for this species, is so vague, and bears so few marks of his usual accuracy, that I cannot help regarding the question as still in a measure doubtful. The plate under the name of *U. purpurascens* in E. B. t. 641, represents the *U. filiformis*, Fl. Ang.; an error that I feel the more anxious to correct, as I am fearful I ought to consider myself in some degree a cause



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of its having ever existed. It has been previously mentioned that *F. kaliformis* and *clavellus* have hitherto been constantly confounded together, except in the *Flora Scotica*, so that of this plant no description exists in any British author which is not in part applicable also to the other. The specific differences between these two so nearly-allied Fuci are pointed out in the history of the foregoing one; and, as there is no other species for which the present can be well mistaken, I need say no more upon the subject. It bears indeed a close affinity to *F. articulatus*, but is sufficiently distinguishable at first sight by the obsoleteness of the joints, which, if accurately examined, will be found to exist only in appearance, and to be in reality nothing more than external contractions of the frond. In other respects they are very closely allied; and any botanist, who has a pleasure in puzzling himself and others with fragments, may occasionally find in battered pieces of these Fuci opportunities of indulging in this particular.  $\beta$  is a singular variety, not tending to connect it more intimately with the rest, but rather to remove it farther from them. Mr. Menzies, who first gave it to me, brought it from the western coast of Scotland, and assured me it was what Lightfoot intended for his *F. verticil-*



latus, which, however, in general habit it less resembles than the specimens gathered by Mr. Sowerby and myself in the south of England, for which reason I preferred keeping the reference to them.

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#### 74.—FUCUS ARTICULATUS.

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**F. fronde tubulosâ concatenatim articulatâ ramossimâ; articulis ovato-cylindricis; ramis uniformibus dichotomis verticillatisque.**—Buddle, p. 12. n. 2.—Petiver, p. 25. n. 5.—Fl. Scot. p. 959.—Ner. Brit. p. 28. t. 8.—Linn. Transf. iii. p. 217.—With. iv. p. 90.

**Ulva articulata.**—Fl. Ang. p. 569.

**Fucus sericeus**—var.—Esper, p. 158. t. 82.

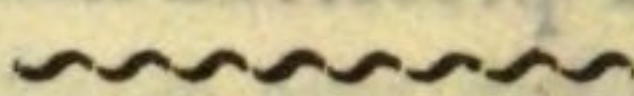
**Corallina lenta purpurea compressa.**—R. Syn. p. 34. n. 9.

**Fucus purpureus humilis tenuitèr divisus geniculatus.**—Moris. Hist. Ox. iii. p. 646. s. 15. t. 8. f. 14.



On the shores of the southern and western counties of England.

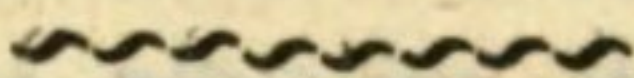
Annual—June—July.



Root creeping, and, with its very numerous shoots, thickly covering considerable portions of the rocks, or larger Fuci, to which it attaches itself; at intervals slightly dilating into solid knobs: fronds about three inches high, scarcely so thick as a small crow-quill; round, tubular, and everywhere regularly articulated, or rather furnished with contractions that have the appearance of articulations, and make the plant resemble a concatenated series of joints, varying in form from cylindrical to ovate, and in length from one line to five, gradually decreasing in size as they approach the summits. Ramification generally takes place very near the root, and is continued frequently at short intervals in an irregularly dichotomous manner to the apices; but, besides this mode of division, the greater branches, especially those towards the upper part of the plant, are in general set round with whorls of smaller ones, which issue from the contractions, and in their origin are sometimes quite spherical, so as easily to be mistaken for the seminal tubercles: these, how-



ever, are very different, being of a form approaching that of a truncated cone, and so extremely small, that, were it not for their darker colour, it would be hardly possible to detect them without the aid of a microscope: their place is on the verticillated shoots, surrounding the upper joints, to which, when the capsules in maturity burst and die away, the small, red seeds, then very conspicuous, adhere without any order. The substance of this Fucus is between membranous and gelatinous, extremely delicate and tender: its colour is either a dark purple, or a pale, but bright red, very transparent; soon changing to a dull yellow.



This elegant little Fucus, by no means an uncommon inhabitant of most parts of the British coast, seems entirely to have escaped the observation of all writers upon the subject, except those of our own country, and Professor Esper, who in this case furnishes us with another most striking instance of the danger of describing these plants entirely from dry specimens, having in his Icones made the present a variety of our *Fucus corneus* (his *F. sericeus*); and in the description observed, that he considers it the same as what Gmelin has figured as *F. alatus* in an early stage of growth.



Ray's error in referring it to the corallines is far less surprising, since in its mode of growth and habit it has a striking affinity to some of those pseudo-vegetables, and the line of distinction between them and the Fuci was not then so well defined as at present. Mr. Hudson carried it to the *Ulvæ*, and in this he was certainly justified, supposing that he found it only after its seeds were scattered, in which state it is by far most common, as the tubercles of all these Fuci, being short-lived, are comparatively rare, and the fronds seem for some time to outlive the destruction of the capsules. Under Dr. Roth's system it belongs to the genus *Conferva*, on account of its tubular structure; besides which, its curiously jointed appearance seems to entitle it to a place there; but these joints, instead of being actual dissepimenta, are merely contractions; for which reason, added to its fructification, I have held it best to retain it at present among the Fuci, uniting at the same time in Mr. Stackhouse's observation, that it is absolutely necessary to sub-divide these plants, or rather to alter the whole of the present system of the marine *Algæ*. In point of colour, size, and the shape of the joints, this species is liable to very great differences, none of which, however, are of such a nature as to render it necessary either



to separate it into distinct varieties, or to say any thing farther for the purpose of keeping it more effectually removed from the other Fuci, the only two among them, to which it is nearly allied, being those between which it is placed; and in the account of both these, some observations will be found upon the subject.

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75.—FUCUS OPUNTIA.

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F. fronde sub-compressâ solidâ articulatâ ramossimâ; articulis obsoletis lanceolatis; ramis horizontalibus acuminatis.—Linn. Transf. iii.

p. 219.—Ner. Brit. p. 104. t. 16.

Fucus repens.—Fl. Scot. p. 961.—With. iv. p. 91.

Ulva articulata  $\beta$ .—Fl. Ang. p. 569.

Tremella marina cæspitosa, segmentis tenuibus.—

Dill. Hist. Musc. p. 50. t. 10. f. 9. A. B. C. D.

$\beta$ . cæspitosus—fronde implicatâ vix unguiculari, apicibus clavæformibus.

Fucus cæspitosus.—Ner. Brit. p. 59. t. 12.

In Cornwall, and near Tenby, in S. Wales, Mr.

Stackhouse; on the shores of the Isle of Wight.

Annual. ?

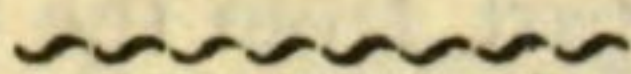
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Root fibrous, creeping; fronds very numerous, much entangled, scarcely above an inch long, solid, sub-compressed, and not much thicker than thread; every where composed of a series of concatenated joints, not distinctly marked, as in the preceding species, but running into each other, so much so sometimes, that in the primary branches they are hardly discernible. The form of the joints is lanceolate, except towards the summits, where they are ovate; their ends are very acute, and sometimes lengthened out into a sharp point. The mode of ramification is uncertain, and, from the matted growth of the plant, by no means easily investigated. In general it seems to consist of long, creeping branches, from which smaller ones grow at right angles, their joints gradually thickening as they lengthen, producing at their contractions others similar to themselves, and also horizontal. The small verticillated shoots, so remarkable in *F. articulatus*, are quite wanting in *F. opuntia*. Dr. Goodenough and Mr. Woodward remark that the upper joints perform the office of tubercles, and produce numerous, very minute seeds; a circumstance that I have never had an opportunity of remarking. The substance of this species is cartilaginous; its colour is always a dull, sub-diaphanous purple.



$\beta$  differs in being scarcely four lines high, and the apices being club-shaped and blunt. Its mode of growth is still more entangled than that of  $\alpha$ .



From Mr. Lightfoot's description of his *Fucus repens*, there appears so very little doubt of the present being really what he intended under that name, that I can hardly consider myself justified in retaining the appellation of *opuntia*, which has been since given it in the Linnæan Transactions, though far more expressive of the habit and character of the plant. Dillenius' figure, above quoted, appears to be by no means an equally certain synonym, on account of the branches shooting out at very acute angles, and the terminating joints being drawn far less pointed than I ever saw them. May it not, therefore, be possible that he confounded it with some of the smaller varieties of *F. articulatus*, to which specimens of it are sometimes found, bearing so strong a resemblance, that many botanists entertain doubts how far they are specifically distinct, and whether the present is in reality any thing more than that *Fucus* in the earliest stage of growth? This question I must in a great measure leave to the decision of those who have frequent opportunities of visiting them on their native rocks; well knowing, from those



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species which abound most at Yarmouth, that such a transformation, however improbable, is far from impossible. At present I have seen nothing to induce me to depart from the opinion of those botanists who have preceded me, and I, therefore, continue to regard them as different; resting their claim to be so considered upon the tubular structure, regular joints, delicate substance, and acute angles of the one, contrasted with the solid, obsoletely-articulated stem, cartilaginous texture, acuminate apices, and horizontal shoots of the other: at the same time Mr. Stackhouse's *F. cæspitosus*, which is here made a variety of the present, is certainly in some measure intermediate; nor does his representation of opuntia well accord with the specimens that were sent me from the Isle of Wight. An observation on the subject in the Linnæan Transactions deserves particularly to be noticed; which is, that their places of growth are very different, articulatus growing not only on the rocks, but being very frequently parasitical on the larger and coarser Fuci, which are usually submerged; while opuntia, on the contrary, is always found on the naked, and often on the perpendicular rocks, between high and low water mark.

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76.—FUCUS AMPHIBIUS.

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F. fronde capillari ramosissimâ ; ramis ramulisque alternis apice involutis.—Fl. Ang. p. 590.—Linn. Transf. iii. p. 227.—Ner. Brit. p. 86. t. 14.—With. iv. p. 116.

Fucus scorpioides.—Gmelin, p. 135.

Fucoides erectum fruticuli specie summitatibus inflexis.—R. Syn. p. 38. n. 4. t. 2. f. 6.

North Wales, Rev. H. Davies ; near Wisbech, Mr. Shrimshire ; most frequently attached to the roots or stems of other plants.

Perennial. ?

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Root fibrous ; fronds very numerous, clustered, cylindrical, filiform, hardly larger than hair ; about two or three inches high, and very much branched : branches all alternate, again and again divided in the same manner ; the ramuli short, and often multifid at their apices, which are very sharp ; those situated at the extremities of the shoots are rolled in like the tail of a scorpion, to borrow Gmelin's expression, but never, that I have been able to discover, contain either mucus or any appearance of tubercles. The lateral ones, at the



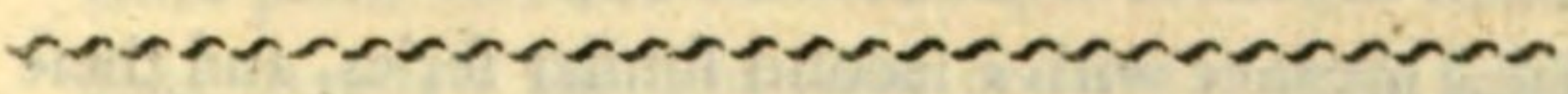
period of fructification, swell into the form of lanceolate, or ovato-lanceolate pods, near a line long, and, viewed through a glass, contain about twenty blackish spherical seeds, disposed in two irregular rows. Something like tubercles may sometimes be observed on the sides of the lower branches, but their shape is uncertain, and they are most probably of a nature similar to the warts of *F. subfuscus*, though their minuteness precludes the possibility of examining them with sufficient accuracy to determine. The substance of this *Fucus* is cartilaginous; its colour a pale, livid, transparent brown, which, when dried, becomes considerably more dark.



The ends of the branches of *F. amphibius*, involuted in a manner similar to those of *Pilularia globulifera*, will always be sufficient immediately to detect the plant, and distinguish it from every British species, except *F. pinastroides*, to which it needs hardly be said that in all other respects it does not bear the smallest affinity; besides this, its diminutive size, capillary frond, and livid hue, are also very striking characteristics: but, above all, its fructification deserves to be remarked, as not agreeing with that of any other of the genus.



and consequently furnishing another proof of the necessity of a new distribution of these plants. There are indeed some of the dark-coloured marine *Confervæ*, which in this respect it altogether resembles, but among the *Fuci* none comes near it; for *F. vesiculosus* and *lumbricalis*, both of which have their seeds placed in their apices, have them also disposed in a mode very unlike *F. amphibius*; the pods of which, examined under the microscope, rather approach those of *F. subfuscus*, or *dentatus*. Ray's figure of this plant in his *Synopsis* is faulty from being too small, but his description is very good, as is Gmelin's, whose name of *scorpioides* was so highly characteristic, that it cannot but be wished that Hudson had adopted it in the second edition of his *Flora*; although it must be allowed that the denomination which he chose also expresses a circumstance in which this species is unlike most others. The plant figured by Professor Esper, under the name of *F. scorpioides*, t. 32. is evidently nothing more than a specimen of *Conferva polymorpha*, though the magnified figure has something singular in the swollen appearance of the ramuli.





## 77.—FUCUS FRUTICULOSUS.

F. fronde filiformi ramosâ; ramis alternatim decomposito-pinnatis, ramulis multifidis setaceis; tuberculis sessilibus ovatis.—Wulfen in Jacq. Coll. iii. p. 159. t. 16. f. 1.—Esper, p. 165. t. 87.

Conferva nigra.—Fl. Ang. p. 595.?

On the stems of the larger Fuci at Weymouth; St. Michael's Mount, and other places in the west of England.

Annual.

Root an expanded, thin, black callus; fronds very numerous, about three inches long, scarcely larger than horse-hair, for the most part quite cylindrical, but sometimes, especially in young plants, slightly compressed. The habit of the plant is in general bushy, from the frond being most commonly divided near the base into two or three principal shoots, each of which is pinnated with a series of alternate branches, the lowest longest, the rest gradually shortening, disposed at small distances from each other, and beset in the same manner with a second similar series, and these



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again with a third, which must be considered the ramuli, and are short, setaceous, and multifid with minute and clustered, but still alternate, setæ, the ends whereof often terminate in a few, fine, woolly fibres, similar to those already noticed in the account of *F. ligulatus*. In old specimens, if examined with a glass, septa are discernible, of a darker colour than the intervening joints, placed in the same manner as in *F. pinastroides*, very close to each other, nor at all affecting the cylindricity of the shoots. All the branches, as well the largest as the smallest, originate in a patent direction, and being endued with considerable elasticity, always preserve it. The fructification consists of obovate, sub-diaphanous capsules, about the size of a small pin's head, sessile on the sides of the upper branches, and, when mature, discharging their seeds by bursting or decaying at their summits. The substance of the plant is tough, and not strictly cartilaginous, yet surely not, as the Abbé Wulfen says, coriaceous. Its colour, when fresh, is a very dark, opaque, reddish brown, which becomes quite black after it is dried.

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Mr. Sowerby and myself met with this elegant little plant in more than one spot during our short tour through the southern counties, and I have

since frequently seen it in collections of the marine Algæ made in that part of England, so that it is hardly probable it altogether escaped the notice of the author of the *Flora Anglica*, and I have therefore ventured above to quote, though with a mark of doubt, his *Conferva nigra*, the account of which, if read with attention, will in most respects be found strikingly characteristic of what is here described. At the same time, as that point can now never be entirely settled, as well from the loss of Mr. Hudson's Herbarium, as from his referring to no figure, and his unfortunate custom of being sparing in the descriptions that he gave of his new species, it was surely best to let this plant remain in the same situation which Baron Wulfen assigned to it, as it is universally known to the botanists of the continent under the name of *F. fruticulosus*; and his representation is so excellent, that it precludes the possibility of any future doubts upon the subject. Besides this, the jointed appearance of its branches is hardly more constant or more visible than it is in *F. pinastroides*. The fruit indeed entirely resembles that of *Conferva coccinea*, and *polymorpha*; but even this, in my opinion, is not sufficient to justify me in removing it to the same genus with them; for both the *Confervæ* and *Fuci* at present

contain individuals so heterogeneous in point of fructification, that nothing positive can be said upon the subject. Professor Esper, in his account of this Fucus, has quoted, as a synonym, Ginanni's Palma marina, t. 20. f. 38, which Baron Wulfen also observes may possibly be intended for it: but surely the figure is done in so coarse and slovenly a manner, that, even supposing it to have been really designed for *F. fruticulosus*, which from the reference to Ray does not by any means appear certain, still less confusion can arise from the omitting, than from the introducing such miserable representations, unaccompanied by descriptions, or even specific characters.

78.—FUCUS VIRIDIS.

F. fronde supra-decomposito-pinnatâ; ramis ramulisque omnibus oppositis capillaceis.—*Fl. Dan.* t. 886.

At Scarborough, Sir Thomas Frankland; among the rejectamenta of the sea at Yarmouth.

Annual.?

Root a small, callous, roundish knob; frond in general solitary, quite cylindrical, rising with an undivided stem, scarcely larger than pack-thread at the base, and thence gradually tapering to the summit, two feet or more long, pinnated throughout its whole length with long branches, disposed at the distance of about half an inch from each other, always opposite, capillary, and again pinnated with others still smaller, which in their turns produce a third, and sometimes a fourth, or fifth series, wherein all are constantly opposite. The fructification is hitherto unknown. The substance is cartilaginous: the colour, when fresh, a beautiful orange, but so fugitive, that, after a few minutes exposure to the air, it becomes a pale, verdigris green, and, if kept some time in fresh water, turns to a light, reddish brown.

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This Fucus, which from the singular property it possesses of repeatedly changing its colour, might with much propriety be called the Chameleon of the marine Algæ, is by that curious circumstance sufficiently distinguished from all its congeners; and, considered as to its nature, has no so close affinity with any one of the British list as with *F. ligulatus*, from which, in its exterior formation, it is so widely different. Its cylindrical stem,



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pinnated with capillary, opposite branches, themselves clothed in the same manner with others, and this series repeatedly continued, will at once distinguish it from every other of the same division, even in a dried state, when its variation of tints necessarily ceases to be visible. The name of *viridis* is extremely objectionable, as giving a false idea, and consequently apt to mislead; but I have nevertheless retained it, since it was the one by which it was called in the *Flora Danica*, where this rare species was, for the first time, described and figured. It was gathered above ten years ago among the rejectamenta of the sea upon the Yarmouth beach, and in some summers is tolerably plentiful there during the months of July and August, in others it never makes its appearance. Sir Thomas Frankland has also found it in a growing state at Scarborough, but it must at present be reckoned among the most rare of the British catalogue. Analogy will not assist us in forming any probable conjecture upon the mode of its fructification, as it does not bear a sufficiently strong resemblance to any yet discovered in fruit. Much therefore remains to be observed, even among those phænomena attending these vegetables that may be considered most open to our inspection, and the conclusion of this work must be in the



same strain as the beginning, that I am fully conscious of its numerous imperfections, and propose it only as an humble essay, resting the sole claim that it possesses to merit upon its faithfully recording actual facts and observations. I would fain hope that the attempt, however insignificant, may be the means of stimulating others to future inquiry; and I can assure the philosophic naturalist, that, while the more stupendous works of the Divine hand arrest the attention of even the most careless observer, and, in a language equally understood by all ages and all nations, declare the glory of God, these humble vegetables will, by the inquisitive mind, be found by no means wanting in affording additional proofs both of the wisdom and beneficence of the great Creator.

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THE END.

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Turner, Dawson,

A Synopsis of the british Fuci

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